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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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Screw Propeller Patternmaking

Making These Peculiar Patterns Without the Use of Templets

Written for The Metal Industry by WILLIAM H. PARRY

The making of screw propeller patterns is not so complicated a proposition as many are led to believe by the curves and twists that develop in the finished product. The air of mystery with which the experts are wont to surround them is but a relic of old-time shop practices that have no place in modern shops. Most patternmakers have never had the opportunity thrust upon them to try their hand at this most interesting work, and many are very thankful for this condition because of the fear that their ability was not equal to the task. There is no good reason why any patternmaker, or, in fact, any woodworker used to laying out his own work, need be afraid to tackle the job of making a screw propeller blade.

The method still in vogue in many of our shipbuilding plants, in which the use of templets is considered the only way to produce the correct lines of at least the back or crown side of the blade is all wrong and does not insure accuracy, which is supposed to be the sole reason for their use. The use of blade templets means that they must of necessity be held at the proper distance from the wheel center to conform to the section at the several points, and must not be slewed around from their correct concentric position. It is not claimed that this feat is impossible to attain, but it is claimed that too much time is consumed, using templets that could better be utilized in properly laying out the segments or laminae that are always used to build up propeller patterns. Also the practice of depending upon the accurate gluing up of a propeller blade spacing of the working side, by the ability of the operator to glue to a line is not the best practice even with the assistance of nail or wood dowels.

The use of a pitch block to provide the proper relative positions of the segments one to the other, so that in gluing up the blades the proper pitch is kept, does not always function well unless made properly, which means a lot of time wasted and some lumber. There is no necessity for the use of templets of any kind in the making of screw propeller patterns.

On Plate I is shown, at Figures 1, 2, 3, 4, 5 and 6, the segments as they appear before being assembled. Figure 7 is a composite drawing showing the segments S1—S2—S3—S4—S5—S6 as glued together, surrounded by the checkerboard lines which give the efficient working area of the blade, or, in other words, the blade as it would appear if flattened out, with a top view of the hub.

Figure 8 at A, B, C, D, E, F, G and H shows the thicknesses of the blade at the center, while Figure 9 is a view of the hub assembly.

At A1, B1, C1, D1, E1, F1, G1 and H1 are shown the shapes and pitch angles of the blade at sections A to H of Figure 8 with the thicknesses and widths of the segments as they would appear at these sections.

Plate I is also a true pitch wheel, which means that it is without radial or axial expansion, though this method can be applied to a wheel of variable pitch.

Plate II shows five views of blades and hubs, the most important of which is figure EH, in that it shows the segments glued together as they would appear if viewed from the side or "on edge," while the curved lines are placed there because they assist in the correct development of the blade. This plate will be referred to later.

Assuming that the usual data furnished on screw propeller blueprints such as the pitch, diameter, thickness and shape of blades and hub is all that it should be, or near it, the very first step to take in laying out is to find the pitch angles given at the various distances from the wheel center. Right here a lot of time could be saved in the pattern shop if these angles and sections such as shown on Plate I at A1 to H1 were furnished by the marine engineer, as it is well within his province to do so.

In any event these angles and sections are the very foundations of a propeller wheel, and are found by getting the circumferences and laying down the angles arrived at on a board so that the sectional shapes and the thicknesses can be drafted. Of course, on propeller wheels of a size other than those used on small pleasure craft, it is not to be expected that the circumferences are to be laid out full size, as scaling down to at least the shop limits is a necessity. Depending on the shape of the blade and the pitch, it will be found that the widest part of the blade does not necessarily control the number of segments that make for the most convenience, as evidenced on Plate I at G1 which has the least width of six sections and yet is a controlling factor in determining the proper number of segments.

By the proper number of segments is meant that they must be of a thickness that will stand handling, and still be within the usual lumber dimensions when planed to an accurate size, keeping in mind that the thinner the segments are the more accurate will be the wheel. On Plate I six segments are shown at C1, D1, E1, F1, G1 and H1, while at B1, five are enough to include that section, and but two are sufficient to include A1 which is at the extremity of the blade. It is of extreme importance that the segment thicknesses be exact so that when placed on top of one another the total thickness of all will measure

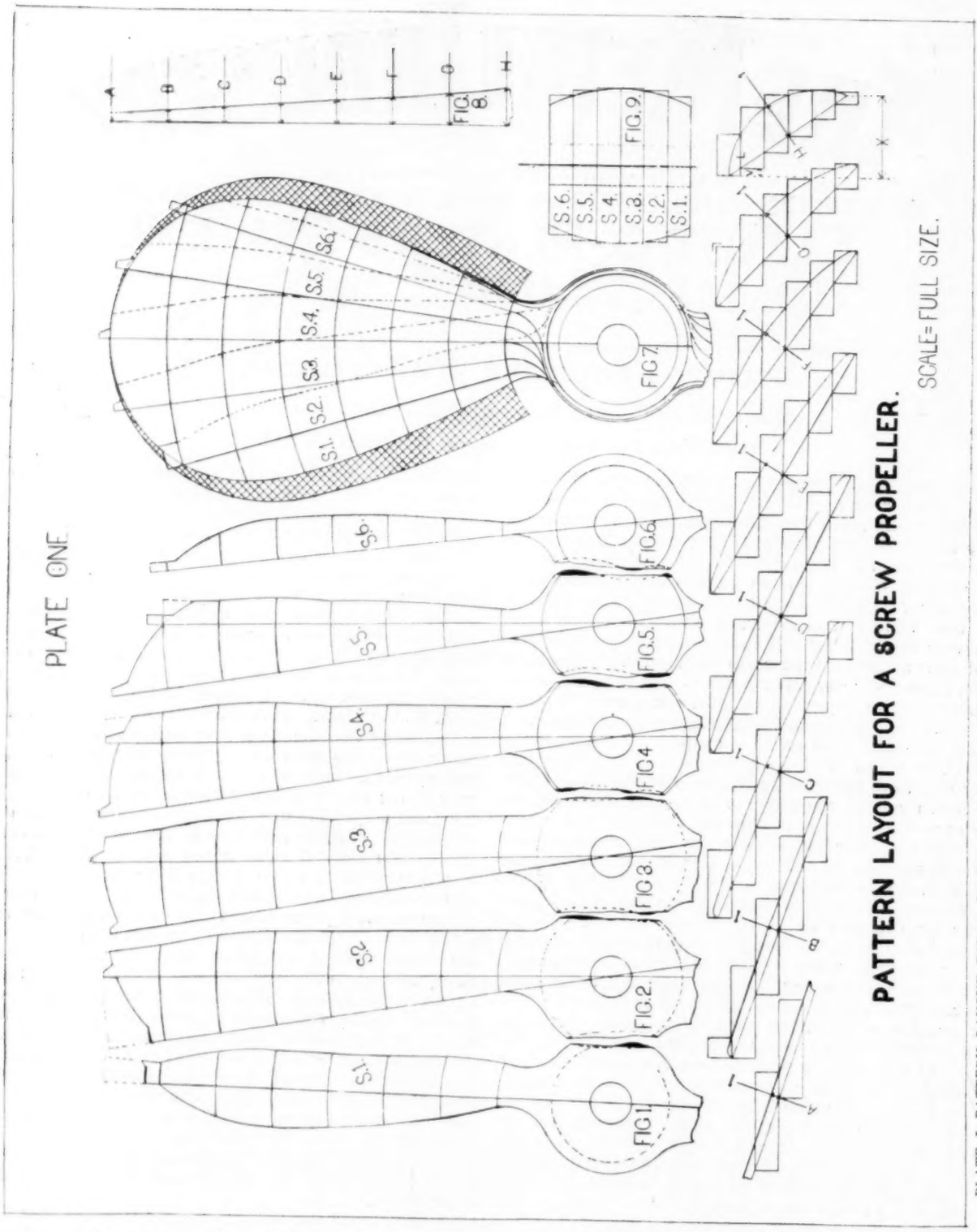


PLATE I—PATTERN LAYOUT FOR A SCREW PROPELLER WITH PITCH AND DIAMETER THE SAME—A "SQUARE WHEEL" WITH A RATIO OF 1

up to requirements, and not be under or over.

Plate I at Figures 1, 2, 3, 4, 5 and 6, labeled S1, S2, S3, S4, S5, S6, shows the various shapes they assume when laid out according to the data furnished by figures 8 and 9 and sections A1 to H1. It will be noted that there are no two alike, with concentric lines scribed to assist in getting the correct dimensions at those distances from the center and dotted concentric lines to show where they are needed for the same purpose and would appear on the segments before being band sawed to shape as full lines.

This being a left hand wheel suppose we take the left hand Figure 1—S1, and follow the layout which will serve to show how the rest are formed.

First draw the radial line; then the hub diameter as at Figure 9—S1; then all the concentric lines, eight in number; then set off on the first concentric line from the wheel center and to the left of the radial line, the distance

as shown at V, H1 from the dotted line to the intersection formed by the pitch angle and the joint of the first and second segments; repeat this performance on each concentric line in succession, taking care to shift to G1, for the second dimension F1, for the third and so on until you reach the seventh section B1, where it will be found that the radial line and the blade width meet. From these intersecting points draw symmetrical curves that ought to intersect at three points. This line will form a good proportion if the blade's shape, and its share of the working and crown side.

To describe the lines that provide for the thicknesses and shape of the back or crown side of the blade the procedure is much the same. The first distance to set off on the first concentric line is the width of the lap of the first joint at L, H1. Then follow along to the next section and concentric line.

Figures 2, 3, 4 and 5 have two radial lines, one of which forms the guide for the working side tooling, while the other is used to set off the distances of the laps that form the crown side of the blade, and to help form the pitch teats that are the surest guides while gluing the segments together.

Figure 6, S6 has but one radial line on its layout, the curved line being to the right and formed the same as Figure 1, S1 with the difference that it is slightly wider at the sections F1, G1 and H1 because the back side of the blade must be provided for as illustrated at X on section H1. There it will be noted that the termination of the blade's width is inside of the vertical lines described by the segments of the three lowest tiers F1, G1, H1.

Section A1 is shown with but two segments and broken section of the blade, for the purpose of getting the proper lap at the joint, and the right width of the segments at the blade's extremity to aid in the initial layout.

The curved and straight lines in evidence to the right of Figures 1, 2, 3, 4 and 5 have a broken appearance and could possibly be made more symmetrical, but their shape is determined by the section of the blade through its center as at Figure 8, and the curves and straight lines of the various sections on the back side.

As before mentioned Figure 9 will serve to illustrate the hub assembly, in this instance of the crowned variety; though it is by no means a common practice so to form them, as the wheel's efficiency is not increased by adopting that form between the blades, and is shown to prove only that there is no need for the use of templets to form crowned hubs, as there are not less than seven guides to aid the operator in forming it.

In gluing up the blade, particularly on wheels of four feet and under, the centering pin method is the surest, if the centering holes are laid out from both sides of the segments, and drilled both ways to a size smaller to permit of accurate gouging to the scribed lines, as no dependence can be placed on holes drilled to size in wood.

Again referring to Plate II we have five views, two of which (Figues W—S1 and W—S2) have no particular bearing on the making of the blade, except to show what the blade will look like from two viewpoints when finished, as the curved lines will differ for every degree or fraction thereof from which the views are taken. At Figure E. H. already referred to is shown the segments assembled with the pitch teats as they will look previous to being lopped off, and the blade edge lines as they will appear when scribed.

At Figure L. H. and R. H. are two composite views of a left and right hand blade looked at from the top with the lines that will develop after tooling.

As the question of whether the wheel is to be a left or right hand one has not been taken up so far, it is of the utmost importance to study these two views as having a decided bearing on the proper way to start building up either. It will be noted at Figure L. H. that the second segment S2 is placed on top of segment S1 to the left and so is each succeeding segment, while the reverse is true at Figure R. H.

Of course, the most of propellers are of the right hand species, but there are lots of the left hand kind made nowadays, and it is well to remember that unless you start building up the segments in their correct sequence, left or right, you may in the end have a wheel the reverse of your requirements.

Let us assume, then, that the blade is glued up and ready for the shaping. The first operation is to cut off the pitch teats, taking care in so doing that you have followed the curved lines of the edge. This leaves the outside shape of the blade all clear, and ready for the layout lines of the working side edge. Right here we will say that there is no necessity of laying out these lines when an experienced propeller patternmaker is on the job, but as this is written for the inexperienced it will be safer to lay out the guide line as shown on Plate II, Figure E. H. on the inside. It is developed with a flexible straight edge and from points on the several concentric lines coincident to the distances as shown at sections A1 to H1 on Plate I and the intersections formed by the radial edges of segments S2, S3, S4, S5 and S6 as they join at the five points where the pitch teats were located.

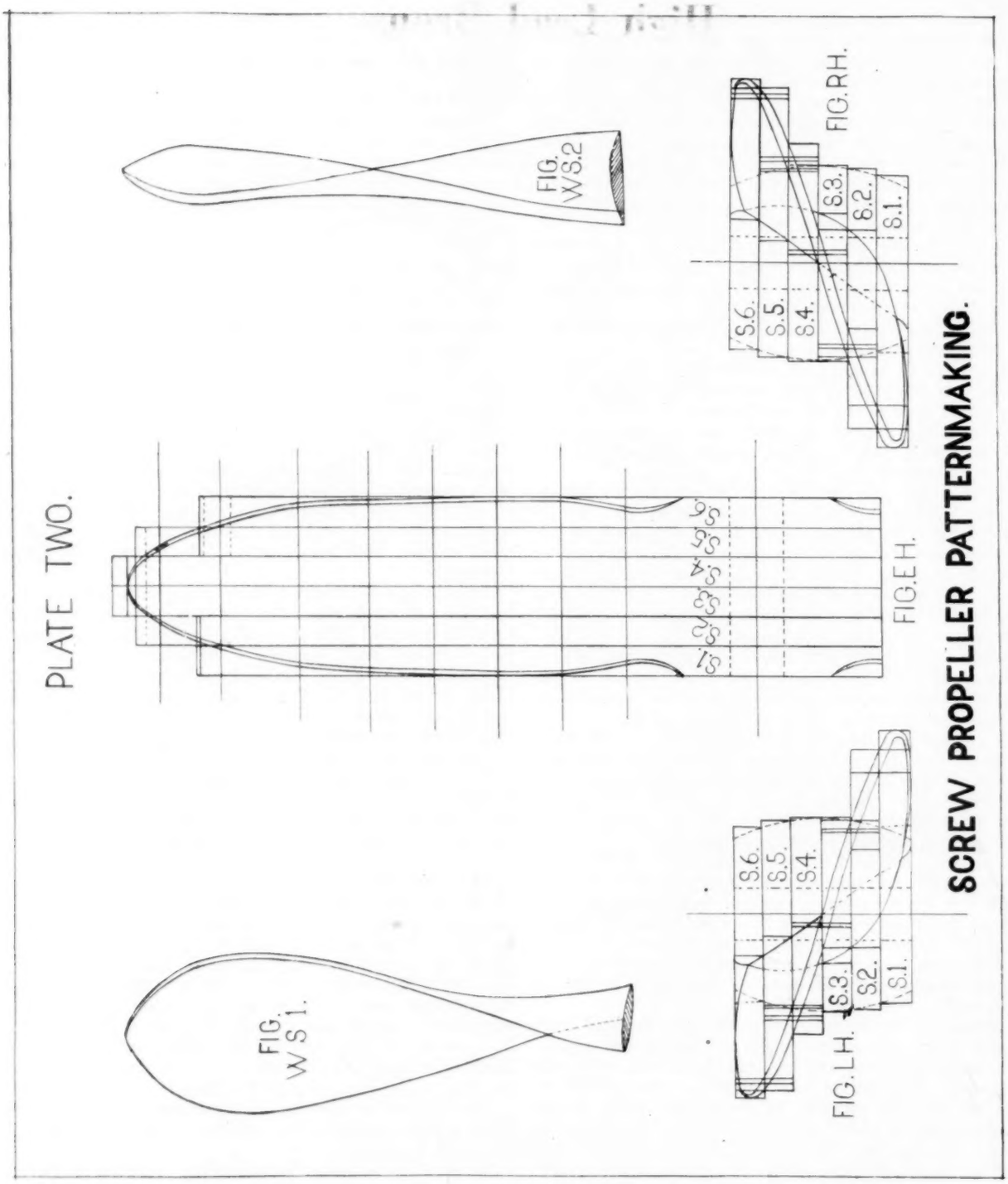
This brings us to the tooling stage where the working side of the blade is the objective, after the excess stock is removed with the help of either adze, ax, drawknife, chisel, gouge, plane, saw or spoke shave with the possibility of all being used at some stage on the one job. It is advised that the green hand be not too reckless in the use of the above-mentioned tools, especially as he approaches the radial glue joints and edge guide lines. If the proper tooling is practiced the result will be a perfect surface for the final finishing with sandpaper, though some patternmakers have the art down so fine that they don't quite tool down to the lines by just leaving enough stock so that sandpapering will bring them out.

The working side finished, a line is scribed by the use of hermaphrodite calipers or otherwise, along the blade's edge (as shown by the outside line of Figure E. H. and partly on Figures L. H. and R. H., all on Plate I to guide the tooling for the shaping of the back or crown side where the surfaces are convex in contradistinction to the working side. This means that great care must be exercised in tooling down, as the lines are approached not in a series of flats, but of convexities differing in all dimensions from the fillet outward, until they merge with the edge at the extremity of the blade.

The last tooling operation is rounding the edges of the blade on the crown side as shown in sections B1 to H1 on Plate I.

To assist in accurate workmanship coloring matter is introduced into the glue so that the radial lines on the working side and lap lines on the back side will be more clearly defined, particularly if the glue originally is white in color and newly cooked. But as most glue worthy of being called so is colored, this expedient is not necessary. In fact a little thought devoted to this matter will prove that it is a false guide, as every part of the glue joints will show the same color even if you happen to dig under the guide lines in tooling or sandpapering.

Another worthless kink resorted to is to black varnish the joints after the blade is glued up, so that a black line will show at the end of the tooling, thus leaving the sandpapering to cause same to disappear. But, as the glue must be scraped out of the corners clean and glue



joints are not always tight, the resulting black line is not safe to follow.

It may be questioned by some as to whether this method of building up a propeller can be applied to all sizes and pitches as well as all shapes of blades and hubs, but a thorough study of Plates I and II, even without recourse to the description will convince any fair-minded man that it will not matter what the conditions may be, as this method is fundamentally correct. Again it may be argued that too much time is consumed in the laying out of the segments, and it must be admitted that it does take time. But it does not take any more, if as much, as it does to lay out and use templets at the various sections of the crown side in the hope that the eye must be depended upon to guide the symmetry of spaces not formed by templets, as manifestly it would not be practicable to make templets for every inch or so of the blade's length. Indeed the use of so many templets would not in the end guarantee their use to say nothing of the time consumed, which be they ever so few means unsatisfactory work.

The infinite variety of blade shapes in evidence everywhere along our coasts and inland waters means that our marine engineers are not at all agreed on what constitutes their most efficient shape and this is true about pitches and the number of blades on a wheel to meet specific conditions, but the users of the method as described here can rest assured that it will apply to any wheel designed.

High Lead Bronze

A Problem in Making an Alloy to Meet Exacting Requirements

Answered by the ASSOCIATE EDITORS of The Metal Industry

THE PROBLEM

I recently received an order for bronze bearings, specifying composition of

Copper	77%	Tin	7%
Phos. copper	2%	Lead	14%

and made up some of the bearings which ran about 125 lbs. each, and upon machining and putting into use, found that it did not hold up, so they came back on me with the report that the metal was not properly alloyed; the lead showing separation from the other metals. The party getting the bearings machined some test bars out of them and they did not come anywhere near to what they claim the specifications called for.

We made another lot of practically the same mixture but added some boron copper and while the castings showed up very sound and clean, yet the test bars would not pull over fifteen or eighteen thousand pounds.

At this point, I wrote to some authorities and gave them the result and asked them what a composition of this kind should pull and the reply was that it should run twenty-eight to thirty thousand pounds per square inch in tensile strength and eighteen to twenty per cent. elongation in two inches; but up to the present, we have been unable to reach this requirement.

Now, in looking up some other mixtures that meet these requirements, I find the mixture is altogether different and I am inclined to think that it is impossible to reach the specifications of this kind in a mixture containing such a high percentage of lead, so in this connection I am asking you for your view in the matter and hope you can furnish me some reliable information that will assist me out of this difficulty.

SOLUTION I.

The formula that you are using is very similar to that which the Pennsylvania Railroad is using as their standard bearing alloy, called Alloy B.

	ALLOY B. COMPOSITION B.	PHOSPHOR BRONZE. COMPOSITION PHOSPHOR BRONZE.
Copper	77	79.70
Tin	8	10.00
Lead	15	9.50
Phos.	Trace	.80

Tensile strength per sq. in.: Alloy B, 24,000; Phosphor Bronze, 30,000; Elongation per cent, Alloy B, 11%; Phosphor Bronze, 6%. The Alloy B wears 1350 per cent slower than Phosphor Bronze, so there is no question as to the formula. I would suggest you to try a heat as follows:

Copper 77	1—Flux
Tin 7	1—15% Phosphor Copper
Lead 14	

Melt the copper, get it good and hot, add the flux. Then stir, and add the phosphor copper. Then add the lead a little at a time. Stir, and add the tin the same way, a little at a time. Stir well, and pour at approximately 1,900 degrees Fahrenheit, and do not make the gate too large. I should think you would not have any trouble in getting 24,000 tensile strength and a fine granular structure. According to the late Dr. D. B. Dudley, this represents the best knowledge that we have on the subject at the present time.

SOLUTION II

Your composition was not properly alloyed, for the reason that your composition is difficult to make unless you know just how to do it. With so much lead as noted (14%), it is almost impossible to avoid segregation. By using a small amount of sulphur, or by using gypsum as a flux, in the presence of a heavy covering of charcoal, as a catalytic agent, the intimate mixture of the lead with the other metals may be brought about. By consulting the back numbers of the METAL INDUSTRY, in which controversy about anti-friction metals, between Messrs. Allan and the Ajax Metal Company, was carried on for some time, you will be able to obtain full particulars as to how they were able to make homogeneous alloys out of mixtures heavily loaded with lead.

Independent of all these restrictions, I believe that the authorities you quote as stating to you that your composition should run 28,000 to 30,000 pounds per square inch, tensile strength, and 18 to 20 per cent. elongation in two inches, are very wide of the mark; they should have stated who made the tests and where.

Some tests made by Mr. Anderson, and recorded in the last edition of the Smithsonian Reports, of Washington, D. C., show the following:

Alloy consisting of 76 Cu, 7Sn, 13 Pb, and 4Zn, has a proportional limit of 19,000 lbs. per sq. in. ultimate strength of 26,000 lbs. per sq. in. elongation of 11%; reduction of area 11.5% and hardness by sclerometer of 8.

Another alloy containing 73.4 Cu, 11.3 Sn, 12Pb, 2.5 Zn and 1P, showed an ultimate strength of 30,400 lbs. per sq. in., elongation of 4%, reduction of area 3.3 and sclerometer hardness of 11.

A comparison of these compositions with the one you have mentioned indicates that they belong practically to the same range of concentrations, the only difference being the presence of zinc in both of the alloys I have mentioned, and the presence of the zinc would have a tendency to stiffen both alloys, and to increase both their tensile strength and their elongations. From these considerations, it would seem to the writer unreasonable to expect from the alloy you have quoted any such physical properties, no matter how expertly they were made. To get the figures the specifications call for, you will have to either increase the copper at the expense of the lead, or you will have to go to an entirely different range of compositions, namely to an increased amount of zinc. In such case you run the danger of getting a poor anti-friction metal.

SOLUTION III

I would advise that it is not feasible commercially to obtain a tensile strength of 30,000 pounds and an elongation of 20% in bearings weighing about 125 pounds when using a composition of copper 77, tin 7, lead 14 and phosphor copper 2%. A similar alloy containing lead 10, tin 10 (standard phosphor bearing bronze) is supposed to give a tensile strength of 28,000 pounds with 9% elongation. This result, moreover, is only obtained on a standard 9/16" diameter test specimen.

Where a test piece is cut from a large bearing, you are fortunate if you obtain 70% of the tensile strength and the elongation of the small text specimen. The large casting sets very slowly and this gives a coarsely crystalline structure, that is, soft and weak.

Chilling the bearing will give a finer grain and greater strength and pouring at the lowest possible temperature also increases the strength but it may result in other difficulties, such as, blowholes, etc.

Electric vs. Crucible Furnace

A Continuation of the Discussion Begun in Our June Issue

MR. SIMPSON'S OPINION

To the Editor of THE METAL INDUSTRY:

In your April, 1921, issue, under "Correspondence and Discussion," we notice a letter signed "Equipment Engineer," on the subject of "Cost of Melting Non-Ferrous Metals."

This letter is evidently one intended to criticize adversely the electric brass furnace and to qualify fuel-fired furnaces instead.

The article quite correctly lists the various items, one to seven, of cost, except that "Equipment Engineer" does not specifically mention the cost of crucibles, which in the crucible-fired furnace are far too large an item to lump in with any other cost item and require a separate item for the reason that crucibles very often constitute a cost as large as fuel and labor put together.

Neither does "Equipment Engineer" list in his items the depreciation in the quality of metal in open flame fired furnaces. It is well known that the grade of the metal is appreciably reduced by melting in the presence of an oil or gas flame and it is also known that electric furnace metals are refined or improved in quality by melting in a non-oxidizing atmosphere. Therefore, he should have included a special item on metal depreciation in the flame-fired furnaces; also on large metal losses.

Your correspondent is evidently a man not versed in electric furnaces or electricity, for he uses incorrectly the word "power-factor" quite freely in a number of places in his article. I feel constrained to call attention to the improper use of this word in its accepted meaning. Your correspondent uses the word "power-factor" to mean what is properly meant by the word "load-factor." "Load-factor" means the average load or use of the apparatus (as rated by time of use integrated into per cent of capacity used) as a fraction of the full-time full load hours.

The phrase "power-factor" means an entirely different thing, namely, it means the effective power or true watts of an alternating current power circuit figured as a percentage of the apparent energy or kilovolt-ampere current circulated.

Thus it will be seen that the power-factor of the furnace has nothing whatsoever to do with the percentage of time of use of the furnace, or the percentage of its rated capacity to which it is used, but refers only to the characteristics of the electric circuit and on ordinary single phase type brass melting furnaces this power-factor usually works out to be approximately 70 per cent. That is to say, the true power as paid for by the watt-hour meter, approximates 70 per cent of the apparent power as indicated by the volts times the amperes as read on the switchboard instruments. It would be unfortunate for the readers of METAL INDUSTRY to be confused on this subject, hence this correction.

It is true that a more expensive electric furnace cannot be justified, if not used on a load-factor sufficiently high for its savings and improvement in quality of the metal to pay the difference in its overhead cost (interest, taxes, insurance, etc.). It is felt that many users are making the mistake of installing electric furnaces much too large for their requirements, in view of the great rapidity with which such furnaces operate.

A furnace being built by the concern with which I am connected, for instance, will melt down an ordinary rated charge in forty minutes and since it is fitted with two crucibles and since one of these insulated crucibles will readily hold its molten charge at a casting temperature for a period of one hour when removed from the furnace, it is thus quite possible that with the duplicate crucibles furnished this furnace can make castings of two to three times the rated capacity of the furnace. At the same time the cost of the furnace is a minimum and the loss of heat and oxidization of electrodes is reduced to the lowest limit and the "power demand" kept to the lowest figure by use of an economical size furnace.

PITTSBURGH ELECTRIC FURNACE CORP.
George L. Simpson, Engineer.

Pittsburgh, Pa., June 28, 1921.

MR. EASTICK'S ANSWER TO MR. SIMPSON

In reply to Mr. George L. Simpson, I wish to correct Mr. Simpson in his assumption that the purpose of my letter in the issue of April, 1921, was to criticize "electric brass melting" and qualify "fuel fired furnaces" instead. There are too many variations in furnace design, methods of applying heat to the work, and above all too great a diversity of conditions for any one to attempt any broad, general comparison between "electric brass furnaces" and "fuel fired furnaces." The purpose of my letter was to point out some of the factors which are likely to be ignored or glossed over and also to urge that each problem he carefully studied by the fuel and furnace engineer and the metallurgist, rather than to allow some clever salesman of furnaces to have his way.

With regard to cost of crucibles, this expense was covered by Item 6 (Supplies). I disagree entirely with Mr. Simpson that the cost of crucibles is often as large an item as fuel and labor. The cost of crucibles depends largely on the way they are treated, but even when this treatment is at its worst, crucible cost is rarely as much as the labor alone.

The statement that the quality of the metal is appreciably reduced by melting in the presence of flame and that metals melted in electric furnaces are refined and improved is not in accordance with the facts. Inferior quality of metal has been produced from both electric furnaces and open flame furnaces, which would indicate that the quality depends largely on manipulation; however, there are alloys for many purposes which require crucible practice rather than the open flame furnace. Certain it is that as high quality of metal can be obtained with crucible practice as with any type of electric furnace.

I am indebted to Mr. Simpson for his clear explanation of power factor.

I am also glad to observe that Mr. Simpson appears to agree that many users are making the mistake of installing electric furnaces of too large capacity. This point is a most important one and I have frequently urged that more consideration be paid to it. H. A. A. EASTICK.

Montreal, Canada, July 30, 1921.

DR. GILLETT'S ANSWER TO MR. EASTICK

I do not wish to prolong the discussion on electric vs. crucible melting unduly, but a couple of points in Mr. Eastick's letter in your July issue require further comment.

Mr. Eastick advocates a gas of 300 B. t. u. per cu. ft. for use in gas furnaces. There are some data on brass-melting with city gas of 600-650 B. t. u. and some with producer gas of 100-125 B. t. u. The latter is described by Greenther (Trans. Am. Inst. Metals, Vol. 8, 1914, p. 289), as tried at the Detroit Copper and Brass Rolling Mills (which plant is now using electric furnaces) where

it took 660 lbs. of coal per ton of 60:40 brass. It would be highly interesting to have Mr. Eastick give us detailed data on the use of 300 B. t. u. gas, so that prospective users might have something more tangible than the mere statement that this gas should melt at a certain rate.

Mr. Eastick greatly underestimates the flexibility of an electric furnace. In the rocking furnace not over 10 lb. of metal need be retained in the furnace after pouring a heat, less if the furnace is carefully scraped and drained. On the basis of 10 lb. retained the variation in analysis caused by this retention would be as follows:

Weight charge	Composition of Charge				Calculated Composition			
Lbs.	Cu	Sn	Zn	Pb	Cu	Sn	Zn	Pb
2,000	88	10	2	..	.....	same	....	....
500	80	10	..	10	80.16	10	0.04	9.80
1,000	85	5	5	5	84.88	5.10	4.95	5.06
1,500	67	..	30	3	67.12	Tr	29.83	3.04
2,000	60	..	40	..	60.04	Tr	39.95	0.01
1,000	74	4	5	17	73.86	3.96	5.35	16.83

By slightly altering the composition of a charge to follow one of different composition, to compensate for retained metal, this slight variation could be reduced. Exercise of a little metallurgical common-sense will show that the alleged lack of flexibility is no bar to operation on different alloys. The induction furnace is of course, less flexible, but it is not designed for such use.

I am very certain that in anything like normal conditions electric melting will pay in plants having anything like large production. It will not pay in the extremely small plant. Between these limits the facts and all the facts must be known before a decision can be made. There is no hard and fast dividing line. If the managers of plants for which no off-hand decision can be made will consider the performance of all types of furnaces in the light of their own special conditions, and adopt whatever furnace is best fitted for them, the industry, as a whole, will advance.

Nothing is to be gained in the long run by advocates of electric melting by claiming a wider applicability for the electric furnace than it really has, nor is anything to be gained by the advocates of some fuel-fired furnace through making sweeping statements that no small brass melter can save money by electric melting. I have been continually surprised by the success of electric furnaces under conditions where they seemed to have only the slightest advantage in melting costs. The range of applicability of electric furnaces is far wider than was suspected in the early stage of their development. It will be worth while even for the small plant to look into electric melting.

Ithaca, N. Y., July 20, 1921. H. W. GILLETT.

Green Gold

Depositing Green Gold from a Green Gold Anode

Written for The Metal Industry by CHARLES H. PROCTOR, Plating-Chemical Editor

Q. Will you please tell me how to make a dark green gold solution by running from a green gold anode.

A. As a rule it is much easier and simpler to prepare a dark green gold solution, directly from gold and silver salts and lead cyanide, than to prepare a similar solution by the porous cell method, to which lead cyanide or sodium arsenite must be eventually added to give the smut. A simple and effective solution may be prepared as follows, from the well known "Trisalyt Salts."

Water	1 gallon
Sodium Cyanide	4 ozs.
Gold Trisalyt	½ oz. ($AuCl_3$—⅓ oz.)
Silver Trisalyt	1/6 oz. (AgCl—⅛ oz.)
Lead Cyanide	1/18 oz.

Prepare the solution in the order given, by first dissolving all the salts in one quart of hot water.

Use the solution warm or cold, according to the smut desired. Voltage four or more. An 18 karat green gold anode should be used.

To prepare such a solution by the porous cell method, prepare a solution from

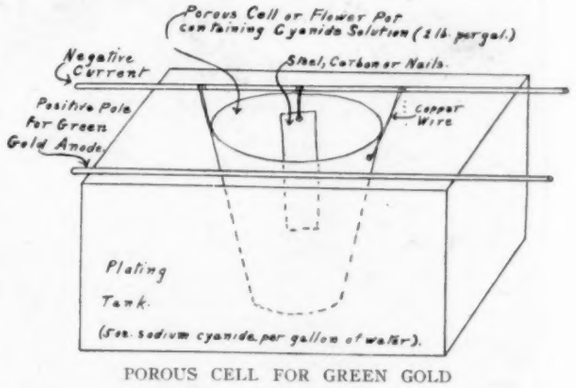
Water	1 gallon
Sodium cyanide	3—5 ozs.

Set up the solution, as you would for regular plating. So that a strong current can be used in the solution, place two 18 karat gold anodes in it and connect them with the positive current. Weight the anodes before starting operations, so that a record may be obtained as to the amount of gold reduced from the anodes. Not less than half an ounce per gallon of solution can be used.

Now, prepare a porous cell (an ordinary red unglazed flower pot may be used) by sealing up the hole with plaster of paris or a tight fitting rubber cork, and by piercing two holes near the top of it, so that iron or copper wires can be inserted to support the pot, upon the cathode or work pole. The wires so secured should be always above the top of the solution, as gold will otherwise deposit upon them.

In the porous cell or flower pot, put a strong sodium cyanide solution, which should average a pound of cyanide per gallon of water.

Secure a piece of cold rolled steel or a piece of carbon or a bunch of steel wire nails will answer. Hang the steel, carbon or nails in the flower pot or porous cell, and secure them to the negative or work pole by a piece of heavy copper wire. Use a strong current at 6 volts and run long enough so that at least half an ounce of gold is reduced from the anode.



POROUS CELL FOR GREEN GOLD

As you will notice an electrolytic action is set up and the gold reduced from the anode tries to deposit upon the steel in the porous cell, but is prevented from doing so by the porous cell, and consequently it goes into solution.

After the gold is reduced, add a little lead cyanide dissolved in an equal amount of sodium cyanide to give the smut.—C. H. P.

Iron-Pot Melting Practice for Aluminum Alloys[1]

A Series of Articles Giving a Complete Survey of Present Day Methods in General and a Detailed Investigation of Iron-Pot Practice in Particular. Part 4

By ROBERT J. ANDERSON[2]

SIZE AND CAPACITY OF FURNACES

The size and capacity of iron-pot furnaces may be variable over quite a wide range, but the conventional furnaces are built in only a few more or less standard sizes. Taking up first the case of the stationary iron-pot furnaces, the capacity of these may vary from about 100 pounds to 400 pounds of No. 12 alloy for circular pots, and from 600 to 1,200 pounds for rectangular pots. The round pots are used more commonly, and only a few foundries in the United States employ the rectangular pots. A very few foundries use both shapes. The round iron pot holding about 300 pounds of No. 12 alloy is a common size; such a pot may be about 20 inches in diameter and 16 inches deep. A bowl-shaped pot 18 inches in diameter and 18 inches deep is another common size; this also holds about 300 pounds of No. 12 alloy. As has been mentioned, the round bowl-shaped pot is used in the majority of foundries, and only a relatively few foundries employ the rectangular pots. The latter are generally of much greater capacity than the round pots; a typical size is 16 inches wide by 37 inches long by 26 inches deep, with a working capacity of 1,000-1,200 pounds of No. 12 alloy. In the case of tilting iron-pot furnaces, rather larger pots are generally used than in the stationary furnaces employing circular pots, although the employment of 100-pound capacity pots has been reported for the former. Usually, however, pots holding 400 or 600 pounds of No. 12 alloy are used in tilting furnaces. These may be bowl-shaped or nearly cylindrical in shape. Table 2 gives the sizes and corresponding capacities of a number of commercial iron pots as used in stationary and tilting furnace installations.

As to the shape of the pot to be used, the question is often asked: What is the preferable shape, i.e., bowl-shaped, cylindrical with a rounded bottom, or rectangular? Considering first the pots with a circular opening at the top, these may be in the form of a hollow paraboloid, with a rounded bottom. No data are available as to the preferable shape of round pots, but a pot with a very flat bottom will tend to fail more rapidly than one which is more conical in form. The pot tends to stretch in service owing to the pressure from the weight of the charge,

[1]Published by permission of the Director, U. S. Bureau of Mines.
[2]Metallurgist, U. S. Bureau of Mines, Experiment Sta., Pittsburgh, Pa. Parts 1, 2 and 3 were published in May, June and August, 1921.

FIG. 5. VIEW OF INSTALLATION OF STATIONARY IRON POT FURNACES

TABLE 2.
Sizes and capacities of iron pots used in furnaces.[18]

Type of furnace.	Round Pots: Size of pot, ins. Diam.	Depth.	Thick. of pot, ins. at flange.	the bottom.	Working capacity in pounds of liquid No. 12 alloy.[19]
Stationary	22	22	0.5	1	400
Stationary	19	17	0.75	1	250
Stationary	15	15	3/4	0.75	200
Stationary	18	18	0.75	1	250
Stationary	20 1/8	15 1/8	0.75	1	300
Stationary	36	30	7/8	1.25	300
Stationary	16	14	0.5	1	100
Stationary	20 1/8	15 5/8	0.75	1	300
Tilting	18	21.5	7/8	1	350
Tilting	22	12	0.5	1	200
Tilting	30	16	0.5	7/8	400

Type of furnace	Rectangular Pots. Size of pot, ins. width	length	depth	Thick. of pot, ins at flange	the bottom	Working capacity in pounds of liquid No. 12 alloy.[19]
Stationary..	16	37	26	1	1½	1,200
Stationary..	16	38	16	1 13/16	1 13/16	750
Stationary..	15	37	25	1⅛	1½	1,000

a frustrum of a blunt ellipsoid, or practically cylindrical and pots with a flat bottom will tend to fail at the juncture of the sides and bottom. With the more conical form, the weight of the charge is more uniformly distributed. Circular pots are preferable to rectangular pots for the same reasons. The thickness of round iron pots is variable, but usually the thickness is from 0.5 to 0.75-inch at the flange, and about 1 inch at the bottom. The rectangular pots are usually somewhat thicker than the round pots; thus the thickness may vary between 1 and 1.5 inches. In the case of the round pots, the thickness usually varies from the flange to the bottom, being greater at the bottom; in the rectangular pots the thickness may be varied from the flange to the bottom, or it may be the same throughout. It may be added here that after being in service for several days the capacity of an iron pot is greater than when it is first put in the furnace. This is owing to stretching. Thus in an observed installation, a round iron pot when first put in was 21.5 inches deep; after being in service for eight days the depth was 24 inches.[20] When new, this pot had a capacity of 350 pounds of No. 12 alloy, while after eight days' service the capacity was 425 pounds.

The weight of iron pots is necessarily very variable depending upon the size. As will be explained in detail later, the pots are made of gray cast iron, or of so-called semi-steel. A rectangular pot 38 inches long by 16 inches wide by 16 inches deep and 1 13/16 inches thick weighs about 775 pounds made in semi-steel. A round pot 19 inches in diameter by 17 inches deep, having the

[18]Reported as being in use at aluminum foundries.
[19]Capacity as given; this is the operating capacity and not the actual capacity.

[20]Private communication, R. J. Boshirt, January 19, 1921.

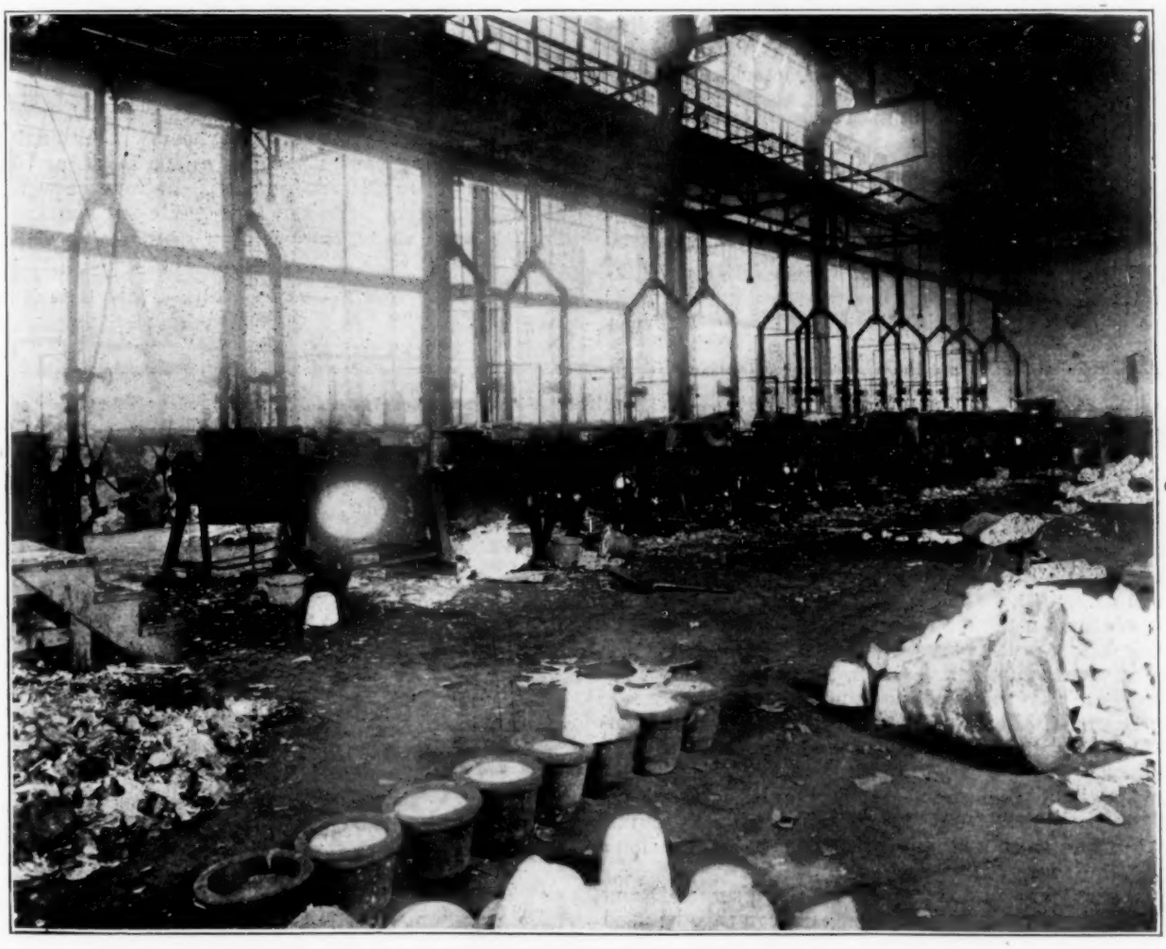


FIG. 6. BATTERY OF TILTING IRON POT FURNACES

form of a frustrum of a blunt ellipsoid, weighs about 200 pounds made in gray cast iron. No data are available as to the effect of the thickness of an iron pot on its life, but evidently longer life should be expected with thicker walls.

FURNACE LININGS AND THEIR LIFE

Firebrick of a good refractory grade is most generally used for lining the furnace shell in the construction of iron-pot furnaces of both the stationary and tilting types. In the case of the stationary furnace, the shell is usually lined with one course of 4-inch firebrick. Extreme limits of 2.5 and 4.5 inches thick have been reported for firebrick linings in these furnaces, but the 4-inch lining is most commonly used. The use of silica brick, 4 inches thick, has been reported by one plant. In one installation, the iron shell of the furnace is lined with one course of 4-inch firebrick covered with a thin layer of carborundum fire sand. In another installation, the use of a 3-inch thick lining of a commercial high temperature cement (so-called "Hytempite") was reported, and the outside surfaces of the iron pots were covered with a layer of this cement. Generally speaking, the stationary iron-pot furnace is usually built by simply lining a suitable iron shell with a 4-inch thick layer of good grade standard firebrick, and the pots are set in from an opening at the top. In the case of tilting iron-pot furnaces, which are normally circular in shape, a cylindrical iron shell is lined with a 4-inch thick layer of standard firebrick. In some installations the inside of the iron pots is lined with various washes or coatings, but these will be dealt with more fully in later paragraphs. The use of special refractory brick, such as magnesia, bauxite, chrome, alundum and carborundum brick in iron-pot furnaces is not known, although certain of these refractories have been used as the actual lining in open-flame and other furnaces.

The life of furnace linings in iron-pot furnaces is variable depending upon the kind of lining, the fuel used, the speed of melting and other factors. Some data are given in Table 3 which convey an idea of the length of life of linings in different furnace installations. On the basis of reported figures, extreme limits of 150 and 1,300 heats and a life of three to 12 months have been obtained. With a 4-inch thick firebrick lining, the life of a furnace running seven heats per day should be at least six months. Of course, the life of a lining may be considerably prolonged by careful examination followed by patching any broken or worn places at frequent intervals, and this practice is to be highly recommended. The effect of the kind of fuel used upon the life of linings is not known, although it is likely that with more concentrated fuels, i.e., those with high calorific values, like oil, the life would be shorter under otherwise identical conditions, than with natural gas and other common gaseous fuels. It is not possible from the data given in Table 3 to deduce any conclusions as to the effect of the thickness of the lining upon its life, although within certain limits it is likely that thick linings have a longer life than thin linings. If the melting is continuous over a period of eight or nine hours each day, the life of the lining will be longer probably than where melts are made at periodic intervals—the furnace being allowed to cool considerably between successive heats. Continual heating and cooling causes spalling of the brick, and consequently more rapid failure than if the furnace were kept hot over a longer period of time, say eight hours.

TABLE 3

Life of linings in iron-pot furnaces.[21]

Fuel used.	Lining material.	Thickness of lining in inches	Heats per day.	Number of heats to a lining.[22]	Life of lining, months.[22]
Natural gas....	Firebrick	4.5	7	1050	6
Blue water gas..	High temperature cement	3	8	600	3
Oil and gas.....	Firebrick	4	1–2	150–300	6
Oil and gas.....	Firebrick	4	..[24]	...[24]	12
Oil	Firebrick	4.5	6	900	6
Oil	Firebrick	2.5	4	300	3
Oil	Firebrick	4.5	7–10	525–1300	3–6
Oil	Firebrick	4.5	3–5	225–750	3–6
Oil	Firebrick	3.5	..[24]	.[25]	4–6
Oil	Firebrick[23]	4	6	900	6
Oil	Firebrick	4	3–4	450–800	6–8[25]

This article will be continued in our subsequent issues.—Ed.

[21] As reported by foundries to the Bureau of Mines.
[22] Before replacement.
[23] All stationary iron-pot furnaces except this one, which is the tilting type.
[24] Continues melting, nine hours per day.
[25] With repairs.

A HANDY CHART FOR FINDING THE AREA OF A RING*

This chart will be found handy for determining the area of any ordinary ring such as sketched on the chart. It is usually known as "the area of an annular ring." All you need to do is to lay a straightedge across the chart once and the area in square inches is immediately found in column B.

The old and common method is the complex one of squaring radii, multiplying, subtracting, and then wondering if your figures are correct, but this way is "positive." There's no guess work about it.

For example, What is the area of a ring whose distance D (see sketch) is 10 inches and whose width "w" is one inch?

Connect the 1 (column A) with the 10 (column C) and the intersection of the straight line with column B shows the area to be a trifle over 31 square inches. Isn't that simple enough?

It is a very easy matter to measure the distance D and the width with a rule, and the same rule can then be used as a straightedge in solving the problem on this chart.—W. F. SCHAPHORST.

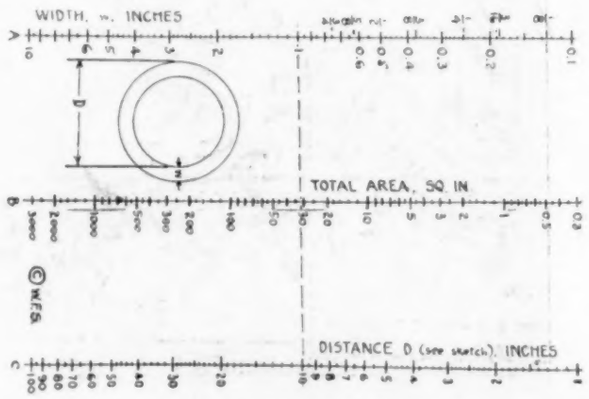


CHART FOR FINDING RING AREAS

*Copyright, 1921, by W. F. Schaphorst.

Practical Plating and Finishing Operations

Lacquer Finishes on Chandeliers

By W. D. SCOTT, Cleveland Branch, A. E. S.

As in plating, care should be taken in seeing that all the work is thoroughly clean.

The following finishes are on brass or steel, but on steel articles a coat of lacquer should be sprayed on first and allowed to dry.

RUSSET BRONZE

Lacquer	50%
Thinner	50%

Russet lining powder, two teaspoonsful; aluminum lining powder, very little. The powder should be mixed with the thinner in a one quart jar, then add the lacquer. Do not use too much aluminum powder, as this gives the work a sanded appearance.

MERCURY GOLD FINISH

This is a very beautiful finish, and throughout the eastern part of the country there is a great demand for it. This mercury gold is produced with a yellow enamel lacquer and a fine gold powder. The work is first bright acid dipped and then the high lights are buffed and colored. A glass spray jar is filled three-quarters full of clear lacquer and one-quarter of yellow enamel lacquer is added to the clear lacquer and thoroughly stirred. To this mixture, add 2 oz. of fine gold powder (a powder that has a brass appearance will not answer the purpose as well) and stir the powder in the lacquer thoroughly. After stirring, the mixture will have a greenish tint. Do not make a stock mixture of this, but mix it ready to use, as it deteriorates after standing a few hours.

When the powder has been thoroughly stirred in the lacquer, it is ready to be sprayed on the work. After spraying the parts of the electroliers and portables, the excess lacquer is relieved from the high lights and the work placed in the oven to dry. When the work is dry, use thinner and a rag and remove the rest of the lacquer from the high lights that was not removed before placing in the oven. The article will have a greenish tint, with the gold powder showing through faintly.

The next operation, and one that will bring the gold powder in relief, is the painting of a pigment powder on the article. This pigment powder is made from Paris green and yellow ochre, adding sufficient of the yellow ochre so that after mixing with Paris green the pigment will have a light green yellowish tint. This pigment is then applied to the work, and then wiped with a rag. This pigment should be dissolved in equal parts of turpentine and boiled linseed oil, to which has been added two teaspoonsful of hard oil finish varnish. Care must be taken that not too much of the varnish is added, as the pigment will settle too quickly, and it will be hard to remove. After the work has been painted with the pigment and wiped off with a rag, the high lights that were relieved with the tinner are lacquered with clear lacquer by employing a camel's hair brush, after which the article is finished.

JAPANESE BRONZE

Finish with No. 90 emery.
Spray on one coat of lacquer.
Dry ½ hour.
Spray on one coat of yellow enamel.
Dry ½ hour.
One coat of Persian blue. To be applied with brush and rubbed off to suit taste.

*The Monthly Review, June, 1921.

Bake in oven until thoroughly dry.
Spray on one coat of lacquer, to get dull finish effect.
Bake in steam oven 1 hour at 130 degrees F. to increase durability of finish.
Brass Parts: To be acid dipped and finished same as castings.

STATUARY BRONZE

Finish with No. 90 emery.
Spray on one coat of lacquer.
Dry ½ hour.
Spray on one coat of the following mixture (very light).

Brown enamel	2%
Tan	1%
Red	½%
Lacquer	96½%

Dry ½ hour.
Spray on one coat of following to suit taste:

Blue	1%
Red	1½%
Lacquer	97½%

Dry ½ hour.
Spray on one coat of lacquer.
Bake in steam oven 1 hour at 130 degrees F. to increase durability of finish.
Brass Parts: To be acid dipped and finished same as castings.

Mounting Grinding Wheels

Grinding wheels should fit freely on their spindles but without unnecessary play. If a wheel is forced onto the spindle there is danger of starting cracks. The diameter of the flanges should be one-half of the wheel diameter (never less than one-third) and the flanges should be relieved or recessed to secure an annular bearing at their circumference. The inner flange should be keyed or shrunk onto the spindle on large wheels. Compressible washers of blotting paper or thin sheet rubber should be placed between the wheel and the flanges to distribute the clamping pressure evenly. The flanges should be clamped just tight enough to hold the wheel firmly. Wheels should be carefully inspected and be tapped lightly before mounting, as new wheels occasionally burst when first brought up to speed because of hidden cracks, resulting from rough handling in transit. P. W. B.

New Way of Making Anode

Take brass, or iron screening, about 1 ft. wide by 2 ft. long, with mesh about 1 inch. Then take scrap and lay on one-half of the screening, pound all down to about one-half the thickness you wish your anode, then take two pieces of rod, bend at end so as to catch about half way down, in the scrap leaving enough rod coming up to the top to bend for hooks. Now put on the rest of the scrap, pound down, then turn the end of the mesh, making a cage of it. Fasten at the top. You can now bend it to go under the barrel, or as it is for a straight anode.

E. ATKINSON.

Bronze Finish

What is a good formula for bronze finish on brass-plated antimonial lead?

1 oz. permangate of potash.
2 oz. chlorate of potash.
1 gal. of water.
Use hot.

Survey of Nickel Solutions

To Bring Together, in an Orderly Fashion, Much of the Data on Nickel Solutions Scattered Throughout Various Sources, That Will Be of Value to the Electro-Plater and to Refute Some Statements, Are the Two Purposes of This Article. Part I

Written for The Metal Industry by JOSEPH HAAS, JR.

In Langbein's, 8th edition of "Electro-Deposition of Metals," page 308, we read as follows: "Boric acid recommended by Weston as an addition to nickeling and all other baths, has a favorable effect upon the pure white reduction of nickel. Weston claims that boric acid prevents the formation of basic nickel combinations on the objects, and that it makes the deposit more adherent, softer, and more flexible. Whether with a correct current strength, basic nickel salts are separated on the cathode, is not yet proved, and would seem more than doubtful. The action of boric acid has not yet been scientifically explained, but numerous experiments have shown that the deposition of nickel from nickel solutions containing boric acid is neither more adherent, nor softer and more flexible than that of a solution containing small quantities of a free organic acid."

It is to be regretted that such a statement has appeared in what is supposed to be the latest and most authoritative work on the Electro-Deposition of Metals, especially since there were in existence two articles that have proved that basic salts of nickel are deposited upon the cathode under certain conditions, and that boric acid is the best addition to prevent their formation; and finally the action of boric acid had been scientifically explained. The first article published was read before the Thirtieth General Meeting of the American Electro-Chemical Society, September 28-30, 1916, by L. D. Hammond. The second article was written by myself, read at the annual convention of the American Electro-Platers' Society in July, 1917, and was published in December 1917.

Experiments on nickel solutions carried on during the years 1915-1919 are in part the basis of this series of articles on nickel solutions. The work of other authors and investigators will also be commented upon and interpreted, so as to be of value to the plater. The first refutation to the above quoted statement from Langbein's will be, in the main, a reproduction of the article written in 1917, and read before the annual convention of the American Electro-Platers Society.

QUALITATIVE STUDY OF THE SINGLE NICKEL SALT SOLUTION

It has been stated from time to time, that successful results could not be obtained from a solution consisting only of the single nickel salt—$NiSO_4$, unless other materials were added to it. This fact had curtailed the use of the single salt, a salt that has many advantages over the double salt $(NH_4)_2\ Ni\ (SO_4)_2$. The plater has feared disastrous results if he used the single salt; or if he did try it out, he worked with a prejudice, and discarded it without a fair trial. The only use that many platers have put the single salt to was to replenish double salt solutions, when low in metal content. Here the plater felt confident that the large excess of ammonium salts would be a protection against bad deposits. With the purpose of finding out just what were the difficulties of a bath composed of only the single salt, the following solution was made up.

Single nickel salts, $7H_2O$-12 ozs. } Contains 2.5 ozs.
Water, 1 gallon } metal per gallon.

From the electrolyzed solution, results tabulated below were obtained. The results showed that the single nickel salt could not be used alone to deposit nickel. This solution, as were all others, was electrolyzed from three to five hours before discarding. Upon analysis, the green deposit was found to consist mainly of nickel hydroxide. Some articles plated at 1½ volts with a current density of 4 amperes per square foot, were buffed after the green scum had been removed with diluted hydrochloric acid. It was found that practically no nickel had been deposited, as a slight touch of the buff exposed the metal beneath.

VOLTAGE.	C. D./SQ. FT.	CHARACTER OF DEPOSIT.	OBSERVATIONS.
0.5	0.75	Grey deposit, black on edges	.....
1	1.4	Black deposit, from edges to center.....	.....
1.5	4	White deposit, covered with light green scum.	Appearance of gas evolution at cathode
2	6	Increase in green deposit.	Gas increased at cathode
3	12	Increase in green deposit.	Gas increased at cathode
4	15	Heavy green deposit....	Violent gas evolution

The next step undertaken was to see if such substances as ammonium chloride, sodium chloride, magnesium sulphate, and sodium citrate could be added to the single salt, and a good deposit obtained. In each case separate solutions were made up of:

Single nickel sulphate, 12 ounces.
Water, 1 gallon.

At first two ounces of the above chemicals were added, and then later two ounces more, unless specified otherwise.

SOLUTION—NICKEL SULPHATE—AMMONIUM CHLORIDE.

VOLTAGE.	C. D./SQ. FT.	CHARACTER OF DEPOSIT.	OBSERVATIONS.
0.5	0.75	Dark stains.....	.....
1.0	1.2	Brown deposit on edges.	.....
1.5	3.0	White deposit on edges, dark in center.....	Appearance of gas at cathode
2.0	6.0	White deposit, green scum	Increase of gas
3.0	12	White deposit, green scum	Increase of gas
4.0	18	White deposit, burnt on edges, coated with green scum.	Increase of gas

The results tabulated above were obtained when the solution was first made up. But after continued electrolysis for three hours, better results were obtained. The ammonium chloride was increased to 8 ounces per gallon. The final result was a good nickel deposit. The explanation of the behavior of ammonium chloride is evident, since continued electrolysis produced an equilibrium similar to that of the double nickel salt solution.

SOLUTION—NICKEL SULPHATE—SODIUM CHLORIDE.

VOLTAGE.	C. D./SQ. FT.	CHARACTER OF DEPOSIT.	OBSERVATIONS.
0.5	0.0	No deposit	.....
1.0	2.0	White deposit on edges, black in center.....	.....
1.5	5.0	White deposit, with green scum	Appearance of gas at cathode
2.0	6	Increase in green deposit.	Gas increased
3.0	8	Increase in green deposit.	Gas increased
4	12	Heavy green deposit....	Violent gas evolution

This experiment showed that sodium chloride is of no assistance, as an addition agent, to produce a good deposit from the nickel sulphate solution.

SOLUTION—NICKEL SULPHATE—MAGNESIUM SULPHATE.

VOLTAGE.	C. D./SQ. FT.	CHARACTER OF DEPOSIT.	OBSERVATIONS.
0.5	0.25	Greenish iridescent.....	.....
1.0	0.75	Black deposit.....	.....
1.5	1.5	White deposit, streaked with black.....	Slight evolution of gas
2.0	4	Green deposit.....	Increase of gas
2.5	6	Green deposit.....	Increase of gas
3	9	Green deposit.....	Great gas evolution

From the results of this experiment, it is plainly obvious that magnesium sulphate will not enable one to deposit from the nickel sulphate bath.

SOLUTION—NICKEL SULPHATE—SODIUM CITRATE.

VOLTAGE.	C. D./SQ. FT.	CHARACTER OF DEPOSIT.	OBSERVATIONS.
0.5	0.0	No deposit	.....
1.0	1.75	White deposit on edges, black in center.....	.....
1.5	6.0	White nickel deposit....	.....
2.0	10.0	White nickel deposit....	No serious gas at cathode
3.0	12.0	White nickel deposit....	Slight increase of gas
4.0	20.0	White nickel deposit....	Slight increase of gas

The results obtained from this solution were fairly good. There was nothing to be desired as far as color was concerned, for test pieces plated for 1 hour at 1½ volts with a C. D. of 6 amperes, and those at 2 volts with a C. D. of 10 amperes, were bright when taken from the solution, and took a good color on being buffed. The deposits obtained were not completely satisfactry in that they were slightly brittle.

The results up to this point may be summarized:

1. Nickel sulphate, Ni SO_4, 7 H_2O, or the Ni SO_4, 6 H_2O cannot be used alone for depositing nickel in solutions of concentration of 12 ounces per gallon.

2. The salts, ammonium chloride, N H_4Cl, from 6 to 8 ounces per gallon gives a good deposit, but is no great improvement over the old double nickel salt solution.

3. The salts, sodium chloride, Na Cl, and magnesium sulphate, Mg SO_4, do not enable one to obtain a good deposit.

4. Sodium citrate makes a fairly good addition to nickel sulphate. It prevents the precipitation of basic salts upon the cathode.

It was now desired to test the influence of various acids on the deposition of nickel from the nickel sulphate solution. Both organic and inorganic acids were tried. The inorganic acids were hydrochloric, nitric, sulphuric, phosphoric and boric. Organic acids were benzoic, acetic, citric, tartaric and succinic. The organic acids hydrochloric, nitric and sulphuric were used in separate solutions each of 1/16, ¼, ½ and 1 ounce. Phosphoric and boric acids were used in 1 and 2 ounces per gallon. The organic acids were used, 2 ounces per gallon. The nickel solution consisted of 12 ounces of nickel sulphate to 1 gallon of water. In all cases good deposits were obtained between voltages 1½, 2½ and C. D. 4—12 amperes per square foot. But in the case of the inorganic acids hydrochloric, sulphuric and nitric, the evolution of gas was so great at the cathode, that the deposits were brittle, and after the solutions had been electrolyzed for 5 hours, the deposit began to become dark in color and the basic salts began to reappear. A slight addition of the respective acid would again whiten the deposit. Phosphoric acid gives a precipitate of nickel phosphate, so it is not advisable to use this acid, as metal is thereby removed from the solution. The acids benzoic, tartaric, acetic, and successive give large polarization values, so that this addition to nickel sulphate baths generally is not advisable. Citric acid gave results similar to those obtained by the use of sodium citrate. Of all the acids boric acid gave the best results, both in color, general character of deposit, and lasting results.

A solution containing boric having the following composition was the means of the conclusion just reached.

NICKEL SULPHATE—12 OZS. BORIC ACID—2 OZS. WATER—1 GALLON.

VOLTAGE.	C. D./SQ. FT.	CHARACTER OF DEPOSIT.	OBSERVATIONS.
0.5	0.0	No deposit.....	.....
1.0	2.0	Dark nickel deposit.....	.....
1.5	6.0	White nickel deposit....	No evolution of gas
2.0	8.0	White nickel deposit....	Slight evolution of gas
3.0	12.0	White nickel deposit....	Increase of gas
4.0	16.0	White nickel deposit, slightly burnt on edges.	Increase of gas

THEORY OF ADDITION OF ACIDS—FUNCTION OF BORIC ACID

By means of the theory of hydrolysis, an explanation of the behavior and function of the addition of acids upon nickel sulphate baths can be given. If a solution of ferric chloride—Fe Cl_3—is taken and tested with blue litmus paper, it will be found to have an acid reaction. This salt, from its chemical composition ought in reality to be neutral. In order to explain this phenomenon, it is necessary to take into consideration certain properties of water usually ignored; that is the ironization of water into hydrogen or H ions and hydroxyl or OH ions. Altho the extent of this ionization is extremely small, so small that the plates cannot measure the conductance of water with the instruments at his disposal, the ionization of water does play a great part, when it is necessary to consider those substances which, though they do exhibit greater ionization than water, are not greatly removed from it. In such cases, the phenomenon of "hydrolysis" makes itself evident. By "hycholysis" is meant that water (H_2O) takes part in a chemical reaction. This can be more readily understood by considering in detail what happens when ferric chloride is dissolved in water. By the dissociation theory:

$$(1)\quad Fe\,Cl_3 = Fe + Cl + Cl + Cl$$

Ferric hydroxide Fe $(OH)_3$ is a substance that is but slightly dissociated or ionized. Therefore in a ferric chloride solution, the hydroxyl or OH ions which are usually present in water cannot exist in the presence of the ferric ions and the formation of undissociated ferric hydroxide Fe $(OH)_3$ results.

$$(2)\quad Fe + 3OH = Fe\,(OH)_3$$

This removal of hydroxyl permits more water to ionize, and the formation of ferric hydroxide continues until an appreciable amount of undissociated ferric hydroxide and dissociated hydrochloric acid—H Cl—have been formed. The hydrogen ions of the hydrochloric acid give the acid reaction to the ferric chloride solution.

$$(3)\quad Fe\,Cl_3 + 3\,H\,O\,H = Fe\,(OH)_3 + H\,Cl$$

By the results obtained in the electrolysis of the nickel sulphate solution, the green deposit obtained showed that when nickel sulphate is dissolved in water, nickel hydroxide—Ni $(OH)_2$—is formed, which, when the solution is electrolyzed is deposited upon the cathode.

$$(4)\quad Ni\,SO_4 + 2H\,O\,H = Ni\,(OH)_2 + H_2\,SO_4$$

The addition of H ions of any acid increases the concentration of the H ions in the system and causes equation 4 to react to the left, and at the same time decreases the ionization of water by hydroxyl or OH combining with H to form undissociated water. In this way the hydrolysis of nickel sulphate is prevented by the sufficient addition of H ions, and basic salts, Ni $(OH)_2$ are not deposited upon the cathode. That boric acid—$H_3\,BO_3$—

is undoubtedly the best acid to use in nickel sulphate solutions to prevent hydrolysis, and to obtain more lasting results in its effects can be judged from its mode of ionization.

$$H_3BO_3 = H + H_2BO_3$$
$$H_2BO_3 = H + HBO_3$$
$$HBO_2 = H + BO_3$$

Chemical data on the ionization of boric acid, shows it to be a very weak acid, not greatly removed from water in ionization, as regards the concentration of H ions. The inevitable conclusion to be reached from all theoretical experimentation and practical results in nickel deposition is that boric acid without doubt gives the proper concentration of H ions to prevent hydrolysis, and still not be as rapidly used up, as is the case of the more strongly ionized acids. Hence the better and more lasting results obtained when boric acid is used in nickel sulphate solutions.

THEORY OF THE ADDITION OF SODIUM CITRATE

It will be remembered that fairly good results were obtained from a solution containing sodium citrate, as an addition agent to nickel sulphate solutions. If sodium hydroxide is added to a nickel sulphate solution, a green precipitate is formed. This precipitate is nickel hydroxide. But if sodium citrate is present in the nickel sulphate solution, no precipitate is formed when the sodium hydroxide is added. This property of preventing the precipitations of metallic hydroxides is possessed by many polyhydric alcohols, and other compounds containing hydroxyl groups. Now, it is reasonable to assume, since sodium citrate prevents the formation of nickel hydroxide by means of sodium hydroxide, that it also prevents nickel hydroxide forming through hydrolysis.

It might possibly be contended by some that the statement quoted at the beginning of this article from Langbein referred to the addition of boric acid to double nickel salt solutions only. To refute such a contention, the following statement is based upon the operation of double nickel salt solutions. If a solution of only the double salts is made up, and operated, in not too long a time, a light green powder will be found upon the articles plated. If this condition is not remedied, it will be found that the deposit will become gritty and impossible to color properly. The addition of boric acid will remove this green powder or basic salt.

This article will be continued in our subsequent issues—Ed.

The National Association of Brass Manufacturers

The Purposes and Aims of This Organization of Manufacturers of Brass Goods

The National Association of Brass Manufacturers, which meets in Cleveland September 14 and 15, was organized in 1902 with A. D. Sanders of Chicago, Ill., as President. The purpose of the Association, as stated in its constitution is "to obtain a closer union between its members who are engaged in the manufacture of Brass Goods, parties hereto, and who may subsequently become members hereof, to collect, collate and disseminate information of interest to the trade, the adjustment of slow and bad accounts, the maintenance of wages, and in all lawful ways to secure mutual co-operation and promote the welfare and interests of its members and the bettering of trade conditions in this line generally."

Any person, firm or corporation engaged in the manufacture of brass goods in the United States or Canada, who has a regularly established business is eligible for membership. At present there are about 40 members.

Past presidents from the time the organization began to the present are as follows:

1902-3	A. D. Sanders	1912-13	Theo. Ahrens
1903-4	H. M. Hoelscher	1913-14	C. C. Hale
1904-5	F. J. Torrance	1914-15	C. C. Hale
1905-6	J. J. Ryan	1915-16	Adolph Mueller
1906-7	C. C. Register	1916-17	C. H. Donne
1907-8	E. F. Niedecker	1917-18	Emile L. Strauss
1908-9	A. S. Hills	1918-19	Harry Speakman
1909-10	J. H. Glauber	1919-20	H. N. Gillette
1910-11	Theo. Ahrens	1920-21	A. I. Fischer
1911-12	Theo. Ahrens		

The other officers for the current year are as follows:

Wilson Cary, Baltimore, Md.....1st Vice-president
R. B. Hills, Haydenville, Mass.....2nd Vice-president
Wm. M. Webster, Chicago, Ill.....Commissioner

The Board of Trustees are as follows:

EASTERN DIVISION	WESTERN DIVISION
Wilson Cary, Baltimore, Md.	W. T. Brace, Chicago, Ill.
R. H. Smith, Springfield, Mass.	Geo. Harper, Burlington, Ia.
R. B. Hills, Haydenville, Mass.	Edw. Niedecken, Milwaukee,
Chas. Lindemer, Trenton, N. J.	Wis.

The delegates to the Chamber of Commerce of the U. S. A. are:

Delegate—Mr. Adolph Mueller, H. Mueller Manufacturing Company, Decatur, Ill.

Alternate—Mr. C. C. Hale, The Peck Bros. & Company, New Haven, Conn.

The delegate to the National Trade Extension Bureau is:

Mr. H. E. Speakman, Wilmington, Del.

This association has in existence at the present time a Standardization Committee, whose purpose is to take under consideration all staple items in the plumbing line and endeavor to have them standardized, and at the same time recommend the elimination of all obsolete articles in the Brass Goods Industry.

STANDARDIZATION COMMITTEE

Adolph Mueller, Vice-chairman	A. I. Fischer
W. J. Schoenberger, Chairman	R. B. Hills
W. H. Wasweyler	H. N. Gillette
E. F. Niedecken	

There is also a Legislative Committee, composed of the following members:

LEGISLATIVE COMMITTEE

Wm. M. Webster, Chairman	Wilson Cary, Md.
John B. Brazier, W. Va.	Karl Legner, Pa.
Adolph Mueller, Ill.	E. A. Eckhouse, Ohio
Chas. K. Dick, Pa.	C. C. Hale, Conn.
H. E. Speakman, Del.	Chas. Lindemar, N. J.
W. C. Chamberlin, Pa.	M. J. Koblitz, Ohio

Whose duty it is to look after all matters pertaining to legislative questions in Washington and especially after items in the legislatures of the various sections of the country that they represent.

This association has since its inception issued an Official Brass Catalog, which has practically been printed every five years. The latest catalog which is the 1920 edition was a supplement of the 1915 catalog, and from the 1915 book a great number of obsolete items and sizes of staple goods were eliminated. A new List Committee consists of the following members:

LIST COMMITTEE

W. H. Wasweyler, Chairman	W. J. Schoenberger
L. D. Lawnin	Chas. Lindemer
Adolph Mueller	

whose duty it will be to prepare lists and other items incident to a new catalog that will be printed and known as the 1925 edition.

Export Trade in Brass and Brass Manufactures

An Analysis of the Conditions of the Brass Business Throughout the World*

The United States leads all other countries in the production of both copper and zinc, the chief constituents of brass, yet prior to the war Germany and the United Kingdom both surpassed it in supplying the world's markets for brass and brass manufactures. The United Kingdom must import most of the copper and zinc consumed in the country. The zinc deposits of Germany, if those of Upper Silesia be included, are sufficient for domestic requirements, but most of the copper used must be imported.

It is not possible to secure comparable data as to international trade in brass. The variety of articles involved is so great that statistical classifications must of necessity be comprehensive. In the foreign trade returns of many countries imports and exports of brass are included with those of copper and other copper alloys. Moreover, brass products figure so largely as parts of other manufactures that it is doubtful whether the statistics of any country give a picture of the total movement of brass.

GERMAN BRASS TRADE

The value of Germany's average annual exports of brass and brass manufactures from 1909 to 1913 was more than $25,000,000, while average annual imports into Germany for the same period were valued at about $4,000,000. Table A summarizes German exports of brass from 1909 to 1913. In certain items other copper-zinc alloys and nonferrous metals are included, but the total can scarcely be large. The figures do not include brass ordnance or, so far as ascertainable, brass parts of completed machinery and similar manufactures entering into the foreign trade of the country.

TABLE A—AVERAGE ANNUAL FOREIGN TRADE OF GERMANY IN BRASS AND ITS MANUFACTURES FOR THE FIVE YEARS 1909 TO 1913

Description	Exports 1909-13 (5-yr. aver.) (in thousands of marks)	Imports 1909-13 (5-yr. aver.) (in thousands of marks)
Brass, Aich, sterro, delta and durana metals, brass solder, tombac, crude and scrap	10,199	8,593
Rods, sheets, ingots and other shapes wrought or rolled, of brass, tombac, etc.	21,571	1,002
Wire of brass, Aich, sterro, delta and durana metals, tombac, chromium, cadmium, wolfram and other nonferrous metals; iron wire wrapped with wire of these metals	6,349	83
Wire cords and cables made from wire as described above, neither lacquered nor polished, covered with aluminum or nickeled, colored or varnished	†21	.....
Heavy articles of cast brass; furniture springs of brass wire not polished or lacquered	3,996	592
Heavy brass tubes	3,422	651
Light articles of cast brass, lacquered or polished; leaf brass; leaf metal and tombac articles	44,007	3,875
Articles of copper, tombac, and brass, varnished, colored, covered with aluminum or nickeled	19,552	1,661
Total	109,117	16,457

Distribution of German prewar exports is of the greatest significance in relation to the nature of international competition to be faced in the immediate future. Two-fifths of the total value of German brass exports from 1909 to 1913 consisted of the class designated as "light articles of cast brass, lacquered or polished; leaf brass, leaf metal and tombac articles." More than three-fourths of these exports went to neighboring European countries, Russia and Austria-Hungary together taking one-fourth of the total.

The group of manufactures designated as "articles of copper, tombac and brass, varnished, colored, covered with aluminum or nickeled," had practically the same distribution. Brass, Aich's metal, etc., exported in the crude form or as scrap, were also nearly all sold to Germany's European neighbors, France being the largest buyer.

One-fifth of the total value of prewar German brass exports consisted of rods, sheets, ingots and other wrought or rolled shapes. Exports of this class practically doubled from 1909 to 1913. Table B shows the distribution by countries in gross tons in 1909, 1913 and for the five-year period.

TABLE B—EXPORTS FROM GERMANY OF RODS, SHEETS, INGOTS AND OTHER WROUGHT OR ROLLED SHAPES OF BRASS, TOMBAC, ETC.

Country of destination	1909 (in gross tons)	1913 (in gross tons)	1909-13 (5-yr. aver.) (in gross tons)
British Indies	5,456	10,761	7,439
Italy	931	1,923	1,246
Netherlands	565	1,590	1,036
Switzerland	688	958	812
Austria-Hungary	778	754	745
Sweden	468	734	608
Denmark	348	639	551
Other countries	1,772	4,122	2,826
Total	11,006	21,481	15,263

BRITISH BRASS TRADE

The value of the average annual exports from the United Kingdom of brass and yellow metal, excluding ordnance, during the five years before the war was about $10,000,000. Imports during the same period averaged about $1,500,000. British figures at that time carried all manufactures of brass in one item, so that it is impossible to determine just what articles were included or their relative importance.

Table C shows British exports of brass, brass manufactures and yellow metal for 1909-13, and for 1919 and 1920. India, the principal buyer of British brass, takes chiefly yellow metal.

By 1913 the Austrian industry had reached a stage of development where an export market was essential. Austrian trade returns do not permit of an analysis of Austrian brass exports prior to the war, but it is known that they were distributed among the neighboring countries of Europe. Austria was also an importer of brass, buying chiefly from Germany. The other metal-working countries of the continent were both importers and exporters of copper, brass and the other alloys of copper, but, excepting in Germany and Austria, imports appear usually to have exceeded exports, the trade being carried on chiefly with neighboring countries.

During the war, Germany and Austria were eliminated as exporters, and supplies in other combatant countries were first of all diverted to meet war demands. Conditions during this time were so abnormal that their present interest lies chiefly in the effect they have had upon post-war trade. Brass is a munition of war, and facilities for brass manufacture were greatly extended during the

*From Commerce Monthly, August, 1921, published by The National Bank of Commerce, New York.

†Three-year average. Item combined with copper and its other alloys after 1911.

TABLE C—EXPORTS OF BRASS, BRASS MANUFACTURES AND YELLOW METAL, FROM THE UNITED KINGDOM

Country of destination	1909-13 (5-yr. aver.)	*1919	1920
	(in gross tons)		
Argentina	†819	269	1,084
Australia	2,528	737	1,615
Belgium	486	†325	857
Brazil	639	164	428
British India	10,730	9,501	29,292
British West Africa	†175	†120	922
Canada	640	71	525
Chile	392	103	294
China, exclusive of Hongkong, Macao and leased territory	154	258	1,064
Denmark, including Faröe Islands	†191	†260	411
Dutch East Indies	‡	‡	527
Egypt	†63	†53	250
France	1,088	1,257	1,135
Germany	1,144	‡	34
Hongkong	¶651	346	605
Italy	396	137	296
Japan, including Formosa and leased territory in China	286	†617	245
Mauritius and dependencies	‡	‡	252
Netherlands	955	1,294	2,769
New Zealand	†424	†148	489
Norway	237	220	331
Portugal	159	146	576
Spain	328	573	1,161
Straits Settlements, including Labuan	331	190	461
Sweden	†158	†56	375
United States	†456	†724	302
Union of South Africa	x†547	†260	809
Other countries	2,324	1,118	2,065
Total	26,301	18,947	49,174

*Exclusive of 253 tons of wire, for which reports by countries in 1919 are not available.
† Exclusive of yellow metal, exports of which were not separately enumerated.
‡ Not separately enumerated.
¶ Exclusive of brass and its manufactures except yellow metal, exports of which were not separately enumerated.
x Exclusive of Orange Free State.

war years. It is estimated that the productive capacity of British cold-rolling mills is six times greater than in 1913. Despite what must have been great difficulty in securing raw materials, the Austro-Hungarian industry is said to have increased eightfold from 1913 to 1918. The German industry undoubtedly grew also, and brass manufactures rose to a place of considerable importance in Japan. American capacity, likewise, expanded greatly. In 1914 there were 992 establishments producing brass, bronze and copper manufactures, with an annual output valued at $162,000,000. In 1919 there were 1,119 establishments whose total product was valued at $488,000,000. Much of the brass plant equipment installed for war purposes would require costly modification for other uses, but active competition for the international trade in brass and brass manufactures will, nevertheless, be the inevitable result of the war-time expansion of the industry.

AMERICAN BRASS TRADE

American statistics of exports of brass and its manufactures are not satisfactory for purposes of comparison. Prior to 1912, the only classification in the export statistics of the United States was brass and brass manufactures, on a valuation basis.

Unsatisfactory as are available data, comparisons of the export trade of the United States in the prewar period with that in the two years since the armistice is of interest. In Table D is shown the value and distribution by principal countries of the exports of brass and brass manufactures from the United States in 1919 and 1920 as compared with the average exports in the five prewar years. Higher prices probably account for a considerable portion of the apparent gain in American exports, but a large part of the increase in total values is also to be accounted for by changes in the character of brass products exported.

Brass scrap was first separately reported in 1912 and in the three fiscal years 1912-14 it made up about one-third of the total value of brass exports from the United States. Practically all American scrap exports were sent to Europe, constituting more than two-thirds of the brass exports of all classes to Europe. In 1919 and 1920 scrap constituted less than 2 per cent of total exports. On the other hand, American exports of brass manufactures, exclusive of sheets and plates, during the last two years constituted more than 80 per cent of the value of all exports of brass from the United States.

The changes which have taken place in the direction of exports of brass from the United States are intimately connected with changes in their character. Before the war, the United Kingdom, Germany and France took a little more than one-third of total American brass exports, but as already noted, the material sent to these countries was predominantly brass scrap for remanufacture. The total value of brass manufactures exported from the United States to Europe has increased somewhat since the war, but European countries cannot be regarded as offering a permanent market to American brass manufacturers. The brass masters of Germany and the United Kingdom are the chief competitors of the American industry, and before the war the European markets were supplied from these countries rather than from the United States. There is no factor in the present situation which would indicate a reversal of this position. Moreover, in the immediate future the high rate of dollar exchange constitutes a serious handicap to the maintenance of the existing market for American brass in Europe.

TABLE D—EXPORTS OF BRASS AND ITS MANUFACTURES FROM THE UNITED STATES

Country of destination	*1910-14 (5-yr. aver.)	†1919	†1920
	(000 omitted)		
Argentina	$53	$688	$786
Australia	118	321	290
Brazil	24	811	696
British India	9	122	169
British South Africa	8	125	100
Canada	3,143	4,035	5,033
Central America	75	204	316
Chile	24	250	199
China	6	169	272
Cuba	211	846	1,737
Denmark	12	405	51
Dutch East Indies	1	185	144
France	264	489	274
Germany	687	‡	25
Greece	3	216	33
Hongkong	3	60	101
Italy	30	526	90
Japan	18	199	261
Mexico	172	462	936
Netherlands	77	832	377
Newfoundland and Labrador	15	42	102
New Zealand	19	138	173
Norway	4	312	61
Peru	9	111	128
Philippine Islands	72	244	353
Spain	6	153	92
United Kingdom	1,797	1,177	1,378
Other countries	239	791	952
Total	$7,099	$13,913	$15,129

* Fiscal years.
† Calendar year.
‡ Less than $1,000.

This article will be concluded in our October issue—Ed.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER, THE ELECTRO-PLATERS' REVIEW

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Contents

EDITORIAL

THE BUSINESS SITUATION

The concensus of opinion seems to be that during the last month business has began to show signs of revival. The first sign of this is, of course, a greatly increased number of inquiries, but these have been followed up by a comparatively large number of orders. Whether this is a flash in the pan, as the Spring "revival" was, it is impossible to know, as yet.

The bulk of the business seems to have come from the automobile industry. If this industry is really coming back into its own, the first great step towards readjustment will have been made. Recent statements by railroads have been very encouraging, largely due to decreased expenses. This, of course, has its other side in the fact that these decreased expenses come, to a large extent, from smaller payrolls, which means men unemployed whose buying power is consequently sharply cut. However, this condition should readjust itself shortly if the railroads can get their heads above water permanently.

The farmers, who were the first to feel the deflation in prices, and consequently the first to stop buying, thus contributing heavily to the slump in manufacturing, are said to be liquidating their stocks of grain, thus freeing large frozen credits and providing themselves with money with which to buy what they need.

Building is still hesitating, although less than before, because of the high costs of building materials and labor.

Exports are still weak, but not so weak as it might appear from figures. Published statements show that it has been cut in half—in dollars. A large part of this cut, however, can be attributed to the drop in prices. Volume has, of course, decreased, but not so greatly as the figures, in dollars, indicate. In connection with exports, an excellent summary of the brass trade is published in this issue, which every brass manufacturer should read. The business of foreign trade resolves itself into a question of credits, and about these, Secretary Hoover says that his optimistic view that we will maintain the flow of our goods is based upon the assumption that we can wisely manage these credit problems. This depends almost entirely upon the banks, and the encouragement of our foreign trade is too greatly to their interest for them to fall behind in this respect.

To be sure, statements of extreme optimism must be looked over carefully. Low inventories and stocks still are (and rightly so) the order of the day; buying is still done only for immediate needs. Nevertheless, there is a decidedly better feeling prevalent.

WASTE AND RESEARCH

The day is past when it is necessary to convince the intelligent industrial world of the value of research and investigation. The war proved conclusively that investigation, even at the cost of what might have seemed at the time large sums spent unproductively, was worth while.

It is clearly evident, of course, that research cannot be carried on successfully in half-measures, and therefore, large numbers of smaller concerns cannot afford to undertake investigations, even though results might prove of great value. The best opening for those who are unable to take it up on such a large scale as General Electric, Eastman, International Nickel, and Du Pont Companies, and others, is to join in some co-operative undertaking, either public or private. The Engineering Foundation, announcing that it is working with the Division of Engineering of the National Research Council (just such a co-operative organization) to promote the National System of Industrial Research, has recently made public through its secretary, A. D. Flinn, a symposium of evidence on the benefits to industry resulting from research scientifically carried on. Some of those who took part in this symposium were Dr. Charles L. Reese, Chemical Director of the E. I. du Pont de Nemours Co.; A. J. Wadhams, General Superintendent of the International Nickel Company; Prof. Jos. W. Richards in charge of the Department of Metallurgy of Lehigh University; Prof. Michael I. Pupin of Columbia University; J. Vipond Davies, president of the United Engineering Society; H. Hobart Porter of Sanderson and Porter, vice-president and general manager of the Brooklyn Rapid Transit Company, and George H. Pegram of the Interborough Rapid Transit Company.

Another shining example of research (although along different lines) which bids fair to help solve some of the worst and longest standing difficulties in industry, is the investigation carried out by the American Engineering Council's Committee on the Elimination of Waste in Industry. Preliminary reports have been published showing the causes of some of the greatest losses and pointing out leaks which run up into fabulous sums. Unemployment, idle equipment, high labor turnover, duplications, restriction of output by both employer and employee, and preventable accidents and disasters make up a tremendous total. Excessive stocks of material carried due to the lack of standardization, it is pointed out, cost hundreds of millions of dollars.

To remedy these conditions it is recommended that:

1. A national industrial information service be established, showing current production and consumption and stocks of commodities.
2. A statistical service be established covering employment requirements.
3. The Government should institute a national policy in the aid of public health.
4. Those who have suffered through accidents should be assisted by a system of industrial rehabilitation.
5. Industrial standardization should be encouraged and carried out to the fullest possible extent.
6. Federal laws which interfere with the stabilization of industry should be revised, presumably to permit business organizations to exist under government control.
7. A set of principles should be drawn up and put into effect for the settlement of labor difficulties.

Such a program, tremendous as it is and calling for an enormous amount of work, recommends itself as a labor which cannot but decrease and perhaps even overcome many of the difficulties which beset us at present.

THE DIRIGIBLE DISASTER

The causes for the loss of the ZR-2 in England, August 24, have not yet been fixed. An investigation is now going on, which will not be made public until it is completed and conclusions reached. However, the most popular theory seems to be that it was started by the buckling of some girders, a consequent disruption of the power and fuel system setting fire to the gasoline, which ignited the hydrogen in the bags.

It certainly should be determined whether the metal or the design was at fault. We doubt very much that the trouble lies with the metal—duralumin. It is possible, of course, that some imperfect pieces found their way into the ZR-2, but very unlikely. Faulty construc-

tion seems, at the first glance, to be the seat of the difficulty.

It has been suggested—and wisely—that the lifting medium should have been, and should be in the future, helium instead of hydrogen, because of the fact that helium is non-inflammable. The United States controls the world's supply and can manufacture it cheaply (ten cents a cubic foot, according to published statements).

The engineering public will await with something more than interest, the findings of the investigating boards.

CORRESPONDENCE AND DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein.

FORD AND ALUMINUM

It was rumored for a while that the Ford Motor Company intended to enter the field of aluminum production, and to use the Muscle Shoals, Ala., plant for this purpose. No definite confirmation has yet been obtained, however. A letter from the Ford Company reads as follows:

To the Editor of THE METAL INDUSTRY:

Up to the present time we have not been actively investigating the manufacture of aluminum further than what our general observations might be as to the economical production of any of the metals used in our products.

FORD MOTOR COMPANY,
Detroit, August 19, 1921. Wm. H. Smith.

STEAM TURBINE BLADES

To the Editor of THE METAL INDUSTRY:

Many steam turbine blades are made of Parson's manganese bronze but not necessarily so. Most of them are made of a very good quality of brass such as a 72 and 28 mixture, but we have heard also of phosphor bronze and cupro nickel and even in some cases Monel metal, depending upon the specification of the users.

The older and perhaps better way to make such stock is by hot rolling and cold drawing, but it is expensive. It is quite commonly made at present by cold rolling throughout. The metal is made in mill length and cut off by the manufacturer in lengths of 12″ to 14″ to fit the rotor of his machine. The stock has a cross section something in the shape of a crescent with one point blunt. The blunt edge ranges from ⅜ to ½″ thick, and the sharp edge from .012″ up to .018″ thick, while the stock ranges from ⅜ up to 1½″ wide for standard requirements.

The exact method of rolling we do not know, but it must be similar to the manufacture of commutator copper with liberal guides to prevent rolling a camber, viz. curving the strip laterally. The only apparatus required is a mill with special rolls and guides, but these machines have been constructed privately by the brass mills in this country. A cutting-off saw is used to trim the ends. Here the straightening is performed on a bench by hand for edge wide straightening, although most of the straightening can be done on an ordinary 12-roll tube straightener.

August 20, 1921. MILLER.

To the Editor of THE METAL INDUSTRY:

The DeLaval Company makes turbine blades for their own machines which are drop forged steel, the shank being milled to fit the groove in the turbine wheel. They also make a nickel bronze bucket for certain conditions which is cut from a bar of extruded metal which they purchase drawn to the section they require.

The other turbine manufacturers, General Electric, Westinghouse, Allis-Chalmers, Kerr Turbine Company and the Moore Turbine Company, all manufacture their blades by a similar process, I believe.

The Terry Turbine and the Sturtevant, which is of the same type, have an entirely different form of bucket. This type of turbine has the bucket milled out of the turbine wheel forging, so that the finished wheel with buckets is one integral piece.

August 25, 1921. FORGIST.

NEW BOOK

Metallographie, by Prof. Dr. W. Guertler, published by Gebruder Borntraeger, W. 35 Schoneberger ufer 12a, Berlin, 1921, Heft 3, pp. 713-818. Price 39 Marks.

This volume is a continuation of the great work of Dr. Guertler on the constitution of the metals and their alloys. This third part takes up the constitution of boron, cerium and aluminum alloys. In a compact form it gives the latest authoritative data collected from the literature of the world.

The value of a great work like this to all metallurgists, whether they are devoting their talents to research work or to practical applications of their knowledge and skill of treatment to the arts of manufacturing, is the condensed, classified information it presents, available instantly to all who can read the German language. It enables such students, observers and operators to avoid needless repetition in their work, and points out to the foundryman or shop specialist how he can best proportion and compound the new alloys he constantly has to make.

It gives the state of the art of alloying up to date, and almost equivalent to that, it points out what still remains to be done to complete our knowledge of what we ought to know; moreover, the whole work of the preceding volumes as well as the present one, are written in the simplest, purest, classic German, the simplicity of the phrasing, the clear directness of all its assertions, the avoidance of all obscure expressions, the absence of coined words, so dear to the tyro and the newly-fledged "Dipl" engineer, that it becomes a real pleasure to study the record that it gives about all the metals and their alloys that have been thoroughly investigated up to the present time.

The interesting question of the influence of boron on copper is discussed and explained on page 754 as follows:

"An old statement of Marsden (1880) about a boride, B_2Cu_3, is very unreliable. By direct synthesis he had obtained a product with 79.75 per cent. Cu, about 11 per cent. Si, and 9 per cent. B, deducted the silicon and for the remainder calculated the above formula. He must, at least, have produced part of the copper as copper silicide in the deduction.

"According to the observations of Cowles and Marbery (1885), the influence of boron upon copper is the same as that of carbon upon iron. It should increase the tenacity considerably without lessening perceptibly the conductivity. The latter intelligence made it clear, however, that with this influnce it was not a question of the direct effect of boron, but only an indirect one which depends upon the removal of the impurities.

"Moissan (1894) observed that, in the electric furnace, boron easily dissolved in copper, and with the subsequent cooling, it separated out again in the free state. Treatment with acids led to the isolation of pure boron crystals. One must therefore be able to recrystallize boron from copper, and the existence of copper borides therefore appears to be excluded. A later statement of Tucker and Moody (1901) that boron cannot be combined with copper refers therefore only to the crystallized state, and not to the miscibility in the molten state. Recently the General Electric Company (1910) was allowed a patent on 0.1 to 0.03 per cent. boron with copper. It is to be assumed that also this acts chiefly indirectly, in which the impurities slag off and with these collected, leave the metal bath. According to Giebelhausen (1915) by the heating of amorphous boron in molten copper at 1,500° to 1,600° C., wholly in contrast to nickel, no sort of reciprocal action or influence was shown."—R. E. Search.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. REARDON, Foundry; PETER W. BLAIR, Mechanical; LOUIS J. KROM, Rolling Mill; CHARLES H. PROCTOR, Plating-Chemical; R. E. SEARCH, Exchange-Research

ACID RESISTING METAL

Q.—One of our customers has a specification for a metal called Aterite for use in connection with sulphuric acid.

We would appreciate very much if you would advise if you ever heard of this metal, and what the main elements making up this composition are.

Incidentally, does not your experience show that a mixture of 75 to 85 of copper, 10 of tin and 10 to 15 of lead proves about as satisfactory as any in connection with sulphuric work?

A.—Aterite metal is made by a large valve manufacturing company in such work. An analysis of this metal shows one called:

No. 99.	55 copper	One called:	
	30 nickel	No. 16.	55 lead
	6 iron		50 copper
	11 zinc		25 nickel

This metal is hard to handle and requires a lot of experience in handling to make successful castings. The metal is made most successfully in the electric furnace. The best flux to use is aluminum, but special knowledge is required in introducing the aluminum. Otherwise, if the castings are subject to hydraulic pressure, they will leak.

An alloy of 90 per cent. copper, and 10 per cent. tin makes a good acid metal, and is strong and united, and easy to cast. All things considered, it is probably the best mixture that could be used.

Aluminum bronze is an excellent metal for resisting acid, but much harder to cast.

If you want to make a substitute for Aterite metal, we would suggest:

Monel metal shot	40
Copper	44
Hardener	15
Manganese titanium	1

Make the hardener as follows:

Copper	30
Aluminum	10
Zinc	60

—W. J. R. Problem 2,984.

DISCOLORED COPPER SHEETS

Q.—Can you tell us how to prevent copper sheets from turning blue (in splotches) overnight?

This discoloration takes place between the cleaning operation and cold rolling.

The sheets are first hot rolled, then annealed at 1,500 degrees, dipped in water, then in sulphuric acid for 45 minutes, then into water and then through a modern cleaning machine consisting of brushes for removing the oxide, then over steam jets, then through hard rubber rolls to dry them, then under a cool air blast, and placed on wagon. The sheets are perfectly dry when placed on the wagon, but when left on the wagon over night they show large blue splotches as though water had lain on the sheet.

A.—The large blue splotches of which you speak are probably caused by sulphuric acid which has not been washed off. We would suggest that you make the water wash after the sulphuric acid dip more thorough. It is often very difficult to remove the last traces of sulphuric acid or copper sulphates from plates, and it is these traces which we believe are causing your troubles.—A. B. Problem 2,985.

HOT-TINNING ALUMINUM

Q.—Please advise us how we can hot-tin aluminum.

A.—We have never had brought to our attention any installation for the hot-tinning of aluminum. So far as we can see, it would be a very difficult job. The whole point, of course, would be keeping the surface of the aluminum clean enough to allow the tin to adhere to it.

It has been suggested to us that you might try covering the part to be tinned with a resinous flux, such as resin dissolved in wood alcohol. After dipping the piece in this flux, it might be moved directly to the tin kettle and there dipped again. It is worth experimenting with, but you can readily understand that it is simply a suggestion of a possibility and not a statement of a proved fact.—A. B. Problem 2,986.

IRON SOLUTION

Q.—What is the formula for an iron solution?

A.—If you desire a strictly iron solution, the following formulas will give you results.

Water	1 gallon
Ferrous Ammonium Sulphate	2½ lbs.
Ammonium Chloride	4 ozs.

Use soft steel anodes at 2 to 3 volts.

The following method also gives excellent results.

Water	1 gallon
Ammonium Chloride	1 lb.

Hang as many soft sheet steel anodes in the solution as the anode rods will hold. Then place one good-sized steel cathode upon the cathode pole, pass a strong current through the solution at 5 to 6 volts until enough steel is reduced in the solution to give a good deposit. You can readily determine this point by trying a piece of brass in the place of the steel cathode after the solution has been run for an hour or more.

Some black depositing solutions are termed iron solutions. This type of solution is used for antique black finishes. We also give you a formula for this type of solution.

Muriatic Acid	1 gallon
White Arsenic	12 ozs.
Carbonate of Iron	12 "

Heat a part of the acid to dissolve the arsenic.

The solution gives best results without dilution, but water may be added in the proportion of ⅓. Use steel or carbon anodes at 2½ volts.—C. H. P. Problem 2,987.

LEAD—ARSENIC ALLOYS

Q.—Will you kindly let us know what method has been found most satisfactory for combining arsenic with lead in order to make an alloy consisting of approximately 98 per cent. lead and 2 per cent. arsenic? We have tried various methods but find that the loss is rather high and will be glad to get the above information and also to find out approximately what loss of arsenic would be likely to occur in making the alloy.

A.—You will find a fairly detailed description of method of making an alloy of lead and arenic in the proportions you mention in "Metallic Alloys," by Brannt, 3rd edition, pages 370-376. So far as we know this is the only method employed to any great extent. As you state, the loss in making this alloy is high, running from 50 per cent. up.

The only other possibility that appeals to the writer is a method which was applied to the manufacture of phosphorous alloys, in this particular case, copper. In the discussion after the presentation of the paper by P. E. Demmler on "A New Process for Making Fifteen Per Cent. Phosphor Copper." Mr. Demmler mentioned the possibility of making arsenic alloys by the same method. He had no experimental data to back him, however, and his statement was merely conjecture. Nevertheless, it might be worth following up. You will find a reprint of this paper in our issue of July, 1920, page 314.—A. B. Problem 2,988.

MANGANESE BRASS MIXTURE

Q.—Although I have been in the brass foundry business for more than thirty-five years, I guess I have something to learn yet. I have a large order for hose couplings to be made of this mixture:

Copper	60	lbs.
Zinc	37	lbs.
Manganese	1½	lbs.
Aluminum	1½	lbs.
	100	lbs.

My method of melting in a crucible used in oil furnaces was that I put in the crucible first about 30 pounds of copper, laid on top my manganese, then filled the crucible up to the top with more of the copper, which is all clean copper wire cut into short pieces, so as to lie down flat in the pot; then cover with broken glass and charcoal; then take a bottom of an old pot to put on top of that, so that the charcoal will not be blown off. When the copper is all melted, I add my zinc, bringing it up to a good heat. I take it out and pour. Now, the castings look all right, but instead of being a good tough metal, they are very brittle and at times break like glass. As I say, the copper is clean heavy wire, good 99 per cent. pure aluminum and 14 per cent. manganese copper.

A.—The first thing you should look after is to see that your mixture contains no lead. You should look after your copper, and see that there is no solder or tinned copper connected with the copper you are using. You state that you use only clean copper wire. What grade of zinc are you using? Horse-Head or Bertha zinc gives the best results. I would suggest that you mix your copper and manganese copper together. Get the copper good and hot, then add the zinc, small pieces at a time, stirring after each piece is added. Then add your aluminum. It is essential that the copper is at least 2,100 degrees F. before adding the zinc.

If you follow these directions, and still have trouble, I would suggest you try the following mixture: 67 copper, 1½ manganese copper, 41 zinc, ½ aluminum.—W. J. R. Problem 2,989.

MELTING NICKEL

Q.—Being old-time subscribers to your valuable paper, we would like your advice on how to recast a quantity of old nickel anodes we have on hand. We have tried melting them in a crucible in an ordinary brass furnace but cannot do so. We have been told it is necessary to have a blast to melt nickel.

A.—Nickel can be melted in an ordinary brass crucible by simply raising the temperature to the proper point. Nickel melts at about 2,650 degrees Fahr., so it will be necessary to heat it up to about 2,800-2,900 degrees Fahr. for pouring. This can be accomplished in an ordinary brass furnace, either by using forced draft or by having sufficient draft in your stack at hand. If you use an oil or gas furnace, you will simply have to keep on heating your metal until it is up to the proper temperature.

It will be necessary for you to be very careful about oxidizing your metal. A covering of charcoal is advisable and also a de-oxidation just before pouring, by using about one and one-half ounces of magnesium per one hundred pounds of nickel.—A. B. Problem 2,990.

MONEL METAL CASTING

Q.—We are contemplating casting monel metal and would like to have some information on the fluxing agents used in casting this metal. We intend to melt this metal in a pit type furnace. Any information you can give us with relation to the proper way of melting, fluxing and deoxidizing this metal will be very greatly appreciated.

A.—Monel metal can be melted in a pit type furnace, but with considerably more difficulty than brass. It takes about 2,800 degrees Fahr. The practice of melting is essentially the same as that of brass. Charcoal and old glass can be used as fluxes. If necessary borax can be added, but if the melting is carefully done, there should be no need for this, as, if used in excess it cuts the walls of the crucible.

The metal should run smoothly without spitting. Before pouring into the mold, it is deoxidized with a small amount of metallic magnesium, about one-tenth of one per cent. Magnesium is added by taking a piece of it in a pair of tongs, plunging it into the Monel metal bath and keeping it there until it is entirely dissolved. The amount of carbon and other fractional items will affect your metal differently, depending on what you intend to use it for. If you want to make castings, you should have no difficulty with these things. If, however, you want to make metal for rolling, it will be necessary to keep the carbon below .3 per cent.

In casting be certain to allow sufficient metal in the gates and risers. The average figure is from 50 to 60 per cent. Due to the high shrinkage and the quick cooling, it may also be necessary to insert chills wherever the sections are especially large or thick. Your work will have to be carefully gated and special attention paid to it, if you have any small sections adjoining large ones. Thorough stirring before pouring is also necessary.—A. B. Problem 2,991.

VARIOUS FOUNDRY MIXTURES

Q.—(1) What is a good mixture for acetylene welding torches?

(2) What is a good brazing metal for acetylene welding?

(3) What is a good aluminum brazing or welding metal?

(4) What is a good mixture for plumbing supply goods?

A.—(1) The best mixture for acetylene welding torch tips would be:

Copper	89
Aluminum	10
Iron	1

This mixture will give the desired results. This mixture is hard to handle in the foundry; the placing of the risers and gating is very important in obtaining good castings. A mixture that gives fair results for this work and quite easily handled is:

Copper	88
Tin	9
Nickel	1
Zinc	2

The nickel closes the grain of the metal.

(2) A good mixture for brazing solder to use on acetylene welding consists of:

Copper	54½
Zinc	45
Aluminum	½

(3) A mixture said to be used successfully for aluminum brazing or welding consists of:

Tin	63
Copper	2
Zinc	35
Aluminum	¼

This mixture is known as Richards Formula, and is one of the most used mixtures by foundries making their own solder.

(4) For plumbing supply goods such as you describe, I would suggest a mixture of:

Copper	68 to 70
Tin	1 to 3
Lead	2 to 5
Zinc	29 to 22

This mixture can be made approximately by using the following:

Sheet yellow brass	60
Red brass scrap	40

Flux with one ounce of 15% phosphor copper.

The mixture you are using would run near:

Copper	80
Zinc	12
Tin	2
Lead	4

—W. J. R. Problem 2,992.

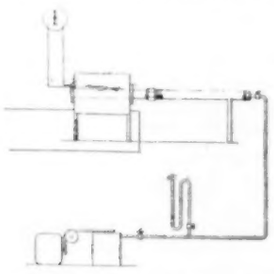
PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,378,052. May 17, 1921. **Process of Coating Steel Sheets with Aluminum.** Samuel Peacock, of Wheeling, W. Va., assignor, by mesne assignments, to Wheeling Steel & Iron Company, of Wheeling, W. Va., a corporation of West Virginia.

This invention relates to a process of coating thin steel sheets with aluminum and has for its object to provide a procedure which will be more efficient in action and less costly to carry out than those which have been heretofore proposed.

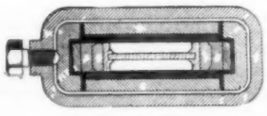
1,379,886. May 31, 1921. **Process of Reducing Magnesium Compounds.** Leonard Waldo, of Plainfield, N. J.



A process of reducing a magnesium compound to metallic magnesium, which comprises finely dividing said compound; finely dividing metallic aluminum; intimately mixing the finely divided materials; closely compacting the mixture under pressure, and subjecting the consolidated materials to the action of a high degree of heat in vacuo, with the formation and distillation over of the metal magnesium.

1,380,248. May 31, 1921. **Electric Furnace.** Charles H. Priestley, of Elizabeth, N. J.

This invention relates to electric furnaces. More particularly the invention relates to an electric furnace in which there may be generated extremely high temperatures or super-temperatures, for the purpose of melting materials.



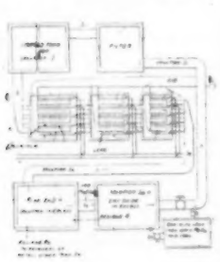
An object of the invention is to provide an electrical furnace in which may be produced extremely high temperatures, and which furnace will be able to withstand increasing gas or air pressure incident to the generating of the temperature.

1,380,142. May 31, 1921. **Plating Bath.** Hugo H. Hanson and Albert C. Walker, of Bangor, Me., assignors by mesne assignments, to Eastern Manufacturing Company, of Boston, Mass.

An electro-plating bath for metals, which contains, in addition to a salt of the metal to be deposited, a relatively small proportion of the soluble material contained in the sulfite liquor resulting from cooking wood by the sulfite process.

1,380,712. June 7, 1921. **Purification of Zinc-Bearing Solutions.** Arthur E. Hall, of Omaha, Neb., assignor to American Smelting and Refining Company, of New York, N. Y.

In the copending application, Serial No. 39,977, filed July 15, 1915, has been described and claimed broadly a novel and efficient process for the electrolytic production of zinc. In the preferred mode of practising the invention, the process involves treatment of at least part of the zinc-bearing solution (the electrolyte) to free it of antimony, and the purifying method described in the application above mentioned consists in treating the solution with blue powder, thereby precipitating the antimony, and also arsenic if any be present.

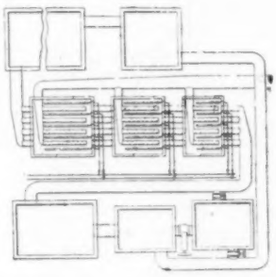


The invention is in the nature of an improvement on the above process, particularly in the purification step thereof, and its object is to provide a cheaper, more effective and more convenient method for the purpose.

1,380,552. June 7, 1921. **Manufacture of Aluminum Compounds from Silicates.** Victor Moritz Goldschmidt, of Christiania, Norway, assignor to Det Norske Aktieselskab for Elektrokemisk Industri, Norsk Industri-Hypotekbank, of Christiania, Norway.

The process of producing aluminum compounds from minerals rich in plagioclases containing combined sodium, which comprises treating the said minerals with an acid not containing combined fluorin.

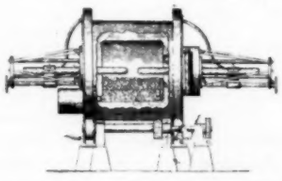
1,380,711. June 7, 1921. **Electrolytic Production of Zinc.** Arthur E. Hall, of Omaha, Nebraska, assignor to American Smelting and Refining Company, of New York, N. Y.



The invention relates to the recovery of zinc in metallic form from oxidized zinc ores, roasted sulfid ores, and particularly zinc oxid fumes, blue powder (also known as zinc dust), cyanid precipitates, and zinc drosses. Its chief object is to provide an effective and economical process for the purpose. In the preferred mode of procedure the process is continuous and cyclical, and the metal is deposited electrolytically on suitable cathodes or starting plates.

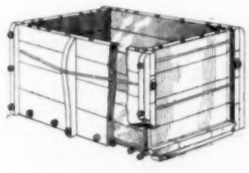
1,380,767. June 7, 1921. **Process for Melting Metal Turnings, Borings, Etc.** William K. Booth, of Chicago, Ill., assignor to the Booth Electric Furnace Company of Chicago, Ill.

The invention is in the nature of an improved method for melting metal turnings or borings, or other small pieces of metal, such as screenings, or concentrates, from floor sweepings and foundry dirt.



The process is especially valuable for melting brass turnings and borings. It may be used, however, for melting borings and turnings of various metals and various metal concentrates, including copper, aluminum, gray iron, steel, etc. The process is especially valuable in the treatment of metals which, while in comparatively small size, nevertheless occupy a considerable space when introduced as a charge into a furnace.

1,381,693. June 14, 1921. **Tank.** John Bauerle, of Cincinnati, Ohio, assignor to the Hauser-Stander Tank Company, of Cincinnati, Ohio, a corporation of Ohio.



The invention relates to tanks formed of wood and especially where used for containing chemicals, acids and the like, in the chemical industry or any other industry using wood tanks, round or rectangular, or in any other form or shape, for holding liquids of any kind, or any wooden vessel.

1,381,720. June 14, 1921. **Method of Separating Nickel.** Alexander McKechnie, of Birmingham, England.

This invention has reference to the separation or recovery of nickel from cupro-nickel alloys or from scrap and other materials where the copper and nickel are present in a metallic state, and it consists in the method hereinafter described and claimed for effecting the separation of the nickel in an effective and economical manner.

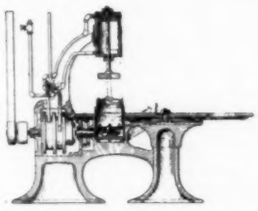
1,382,146. June 21, 1921. **Alloy.** Calvin Vos, of New York, N. Y.

The main object of the invention is to produce an alloy to be used as an agent in the manufacture of steel for any purpose and for making iron and steel castings, which product possesses unusual tensile strength and toughness, said alloy possessing degasifying and deoxidizing properties which render the same of especial value in the manufacture of a flawless product in which such qualities and characteristics are particularly essential and of great value.

1,382,147. June 21, 1921. **Alloy.** Calvin Vos, of New York, N. Y.

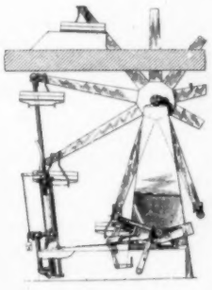
The prime object of the invention is to produce an alloy in which exist degasifying and deoxidizing properties, in addition to which it will act as a medium for introducing into steel, and the ferrous groups of metals, small quantities of zirconium in a fully reduced condition, thereby preventing hard spots so prevalent when zirconium is added by many other well-known methods.

1,383,748. July 5, 1921. **Molding Machine.** Ernest N. Olson and Swan Swanson, of Muskegon, Mich.



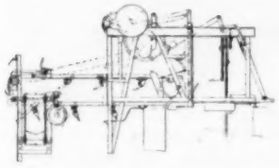
This invention involves improvements in a known type of molding machines wherein are used for purposes of general cooperation a rotary table adapted to be intermittently operated to bring successive mold boxes or molds into operating positions beneath a vertically movable core presser, there being provisions for actuating said core presser to force a core into the mold. The operation of the presser is of course in timed relation to the operation of the rotary table, taking place at a period when the table is stationary.

1,383,729. July 5, 1921. **Controlling Mechanism for Rotary Casting Machines.** Archer A. Landon, of Buffalo, N. Y., assignor to American Radiator Company, of Chicago, Ill.



The invention relates to means for controlling the movement of a movable member or carrier, and the same has for its object more particularly to provide means to control the movement of the carrier of a revoluble casting machine in such a manner that the mold supports which are mounted upon the carrier may be properly positioned to permit of the loading or unloading of the molds thereon or to permit of the performing of any operation necessary or incidental to the casting operation.

1,383,555. July 5, 1921. **Metal-Coating Machine.** Joseph Monto, of Cleveland Heights, and Arthur R. Curtis, of Cleveland, Ohio; said Curtis assignor to Clarence J. Hays, of Cleveland, Ohio.



This invention relates to a galvanizing or metal-coating machine, such, for example, as are used for galvanizing pails and other vessels or articles, the present machine being adapted particularly for galvanizing pails.

One of the principal objects of the present invention is to carry or conduct the articles to be galvanized into, through, out of and away from the metal bath in such a manner as to leave the desired amount, and in fact, the smallest possible amount, of metal on the articles.

1,383,958. July 5, 1921. **Bearing Brass.** Harold G. Martin, of Philadelphia, Pa., assignor of one-half to Michael E. Newgirg, of Baltimore, Md.

This invention relates to an improvement in bearing brasses, and particularly in those brasses designed for use at the rear end of the main connecting rod of a locomotive. In such uses the ordinary brasses, owing to the continual thrust of the connecting rod in opposite directions, are of comparatively short life, being broken at substantially the center of such brasses as a result of the rod thrust.

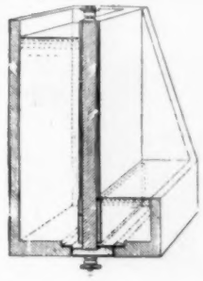
1,383,516. July 5, 1921. **Casting and Process of Treating Castings and the Like.** Fred K. Bezzenberger and Malcolm N. Rich, of Cleveland, Ohio, assignors to the Aluminum Castings Company, of Cleveland, Ohio.

This invention relates to the treatment of metallic articles whereby pores or small openings therein are substantially stopped and the articles thereby rendered impervious to fluids. The treatment is applicable to all metallic articles which are porous, but is of special importance with castings of alloys of aluminum and other light metals which are subject to relatively great porosity and which should for many purposes be impenetrable by air, water, gasoline, etc.

1,384,056. July 12, 1921. **Alloy.** Colin G. Fink, of Yonkers, N. Y., assignor to Chile Exploration Company, of New York.

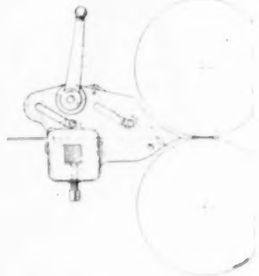
This invention relates to alloys and more particularly to alloys adapted to resist the corroding action of acid liquors. The invention has for its object the provision of an improved corrosion-resisting alloy.

1,384,683. July 12, 1921. **Process for Amalgamating Metals.** Ransom H. Stevens, of Los Angeles, Calif., assignor of one-third to W. R. Crowell and one-third to L. C. Comer, both of Los Angeles, Calif.



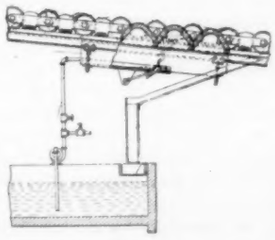
This invention relates to processes for amalgamating metals; and although the process is generally intended and adapted to all kinds of amalgamation work — that is the gathering of metallic particles into the body of a liquid metal mass—coalescing the metallic particles with that mass—the precess is particularly designed for the efficient recovery of gold that has been "floured" with mercury and is recoverable only with difficulty by other methods.

1,385,338. July 19, 1921. **Metal Guide for Rolling-Mills.** William A. Robbins, of Waterbury, Conn., assignor to the American Brass Company, of Waterbury, Conn.



The invention relates to a guide for rolling mills of the type known as peg guides and has for its object to provide a guide which can be more easily operated than peg guides now in use. It further has for its object to provide a guide in the operation of which there is less danger to the operator.

1,384,760. July 19, 1921. **Apparatus for Coating Pig-Metal Casting Machines.** Willis T. Hurst, of Pittsburgh, Pa., assignor to Slag Rock Machine Company.



The invention relates to machines for casting pig-metal, such as pig-iron or pig-copper, these machines being of the well-known type in which casting molds, arranged adjacently to each other, are attached at their ends to a pair of endless conveyor chains which extend over, and are driven by end sprocket wheels.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

NEW JEWELERS' WORKBENCH

A new style jewelers' workbench is being manufactured and sold by Leiman Brothers of 81 Walker street, New York.

This bench is in reality two benches, inasmuch as the back and front of the bench top are identical. It is only necessary to unscrew the combing from the back and put it on the front—turn the bench completely around and a new working front is revealed with a file pine and arm rest hole precisely as the old front had.

This alone is a very valuable feature in a workbench inasmuch as it makes the bench twice as useful. The top itself is made of hard close-grained maple, not as heretofore of a single piece but of strips one inch thick glued together with cabinet maker's glue under extreme pressure.

The first advantage claimed of a top made in this way is that it cannot split, crack or warp, because the grain runs in opposite directions in each piece of the maple and any tendency of one strip to warp is immediately counteracted by the grain running in the opposite direction in the next strip. The cracking or splitting tendency is overcome first by proper conditioning of the maple itself before use and then by running long bolts through the centre of the maple strips from front to rear of the bench top. These bolts have threaded ends with nuts fitted so that they may be kept tightened up when absolutely no crack or split has a chance to assert itself.

LEIMAN JEWELERS' WORKBENCH

This form of construction is ordinarily much more expensive than regular construction as can be very readily understood, but the system of bench manufacture employed by Leiman Brothers, it is claimed, enables them to place these improved benches on the market at the regular prices ordinarily charged for old style benches.

Then there are other improvements in these benches—built-in draw pad, pan slides, the enlarged top draw the full width of the bench giving ample room to the jeweler for all purposes. The iron legs are quickly detachable being made in sections.

The lower metal pan has rounded corners so that all filings are easily and quickly removed without the use of the old style filing cup and holes in the pan—the edges of the metal are embedded in the wood frame of the pan so that filings cannot find lodgment between the metal and the wood.

NEW BRONZE WITH 50% STEEL CONTENT

The American Metal Products Company, Milwaukee, Wis., who have for the past six years been engaged in producing aluminum-bronze castings of approximately 84 per cent. copper, 10 per cent. aluminum and 5 per cent. iron, announce that they have blended another alloy which will be placed on the market immediately upon the completion of their new 80 x 220' foundry, and as soon as proper electrical melting equipment is installed. Work is now progressing on the building.

The analysis of the new "Ampco" Bronze, as given by testing laboratories, is approximately 5 per cent. aluminum, from 13 to 50 per cent. steel and from 43 to 70 per cent. copper, together with necessary amalgamating alloy. This new bronze is bright yellow in color, possessing a tensile strength of upwards of 68,000 pounds per square inch; has a sclerescope hardness of from 28 to 45 points dependent upon the grade produced. It is claimed that it pours readily and is free from blow holes and oxides; it is readily forged, drawn or rolled; can be welded with either acetylene or electric process, and can be cut with a welding tip; it machines more freely than cold rolled steel; readily takes on a very high polish and is acid-resisting to a marked degree; solders as readily as steel.

Its specific gravity is 7.43, making it from 20 to 25 per cent. lighter in weight than ordinary bronzes.

It is stated that it has splendid qualities as bearing and bushing material. A number of bushings being installed on tests, are being run absolutely dry. Other bearings, lubricated, have, it is claimed, had upwards of a month's service in places where ordinary bearings break down in ten days, and show no marked signs of deterioration.

Because of the low price of the steel in this composition, the new metal will sell for a price less than the price of ordinary bronze, in either pigs, billets, or casting form.

NEW TIMING WATCHES

A new instrument of precision has recently been placed on the market which is said to combine all the advantages of the Stop Watch and the Time Study Watch, and has, in addition, a split-second feature. It will be known as the "Split Second Time Study Watch." The agency for Time and Motion Study Watches and other "instruments of precision," formerly held by M. J. Silberberg, has been taken over by the Stein & Ellbogen Company, 31 North State street, Chicago, who will have exclusive control of their distribution. The Split Second Time Study Watch has a double hand, and, in addition to other features, permits the taking of two totally different operations at the same time, or the taking of observations on two closely related operations, each different from the other. The watch has, in addition, the production dial feature used on the Time Study Watch, which saves the mental or pencil computation after the observation has been taken, and gives a mechanical testimony that cannot be questioned, showing the amount of production per hour after one operation has been performed.

For the convenience of their customers, the Stein & Ellbogen Company have established a five-day repair service.

NEW SAND MIXER

The National Engineering Company, 549 West Washington Boulevard, Chicago, have lately developed and have placed on the market a new and larger size of their Simpson Sand Mixer, which they call their No. 3 size, and which has an 8-foot diameter pan.

While this particular size of Simpson Sand Mill has been developed particularly for steel foundry purposes, it is stated that it can also be used to advantage where large capacities are required in gray iron, malleable, brass and aluminum foundries, not only for facing and core sand but for other foundry sand mixtures, as well as for the preparation of daubing to line cupolas, furnaces, etc. The mixing action is brought about by a combination of plows and mullers. The horsepower is claimed

to be very low compared to the capacity, which is increased materially by the use of the patented automatic discharge which has been one of the features of construction in Simpson Sand Mixers. Most of the parts in the No. 3 Simpson Mill are of cast steel.

The National Engineering Company have been manufacturing for some time three other sizes of their Simpson Sand Mixer, including their No. 0, 3 ft. diameter; No. 1, 4 ft. diameter, and No. 2, 6 ft. diameter; so that they are in a position to furnish any size for any foundry, for the preparation of facing sand, core sand, and other sand mixtures, in foundries producing steel, gray iron, malleable, brass and aluminum castings.

SELF-LUBRICATING BEARING

A new bearing material which is a mixture of graphite and high-grade synthetic bronze, and which has self-lubricating qualities of a high order, has recently been developed in the General Electric Research Laboratory, Schenectady, N. Y. Perfection of this material—genelite—is said to have come only after research extending over a period of several years.

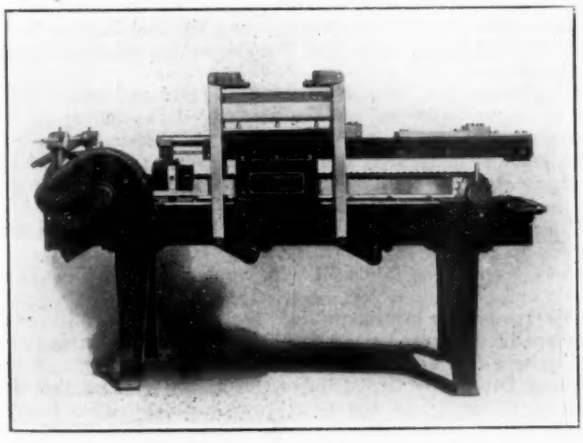
The new material contains graphite amounting to 40 per cent by volume of the whole mass. Tests have shown a high degree of porosity, the metal being able to absorb as much as 2½ per cent by weight of oil.

The metallic component of the new bearings is made from the oxides of tin, lead, and copper, composing a high grade bronze, all the materials being in a finely divided state. Graphite is added in sufficient excess quantity to reduce the oxides to the metals, and leave the required graphite content in the finished material.

The mixture, still in powdered form, is then pressed as nearly as possible to the required shape in massive metal molds. In this pressed form it will not stand much rough handling, so it is given a final bake, which sinters the metals together into a homogeneous bronze, holding the graphite uniformly distributed throughout its mass.

NEW LOCK SEAMING MACHINE

The Stolp Automatic Lock Seaming Machine employs a new method of seaming which is simplicity itself. This method is covered by a "process" or "method" patent which, the company claims will supersede all lockseaming processes now in use, not only because it is simpler, but because it



STOLP LOCK SEAMING MACHINE

produces a very superior lock seam. To illustrate the machine will lockseam taper tubes within certain limits and will lockseam tubes of any thickness of metal. This machine produces the lockseamed article direct from the blank without an extra operation and is also equipped with a self-feeding attachment by which lockseamed tubes can be produced direct from a coil of metal.

This machine was first placed on the market four years ago and so far they have sold all their machines through one satisfied customer telling another, but they have now covered such a large range of articles that they are in a position to accept larger orders.

The following list gives an idea of the uses to which the machine can be put.

Tin Cans and Metal Containers of all kinds, Mailing Tubes, Speaking Tubes, Blower, Exhaust, Ventilator, Conductor and Sewer Pipe. Automobile Muffler Tubes. Automobile Radiator Tubes. Bedstead Tubing. Shade Rollers and Rollers of all kinds. Air Rifle Barrels. Flag, Trolley and Fence Poles. Vacuum Cleaner Handles and Handles of all kinds. Pump Cylinders, Tanks, Metal Ladders, Railings and Fences of all kinds. Railway Lanterns. Mine Sprayers. Metal Picture Frames. Steel Curtains and Doors. Steel Roller Tops for Desks and other articles too numerous to mention. The machine is manufactured by the Stolp Company, Inc., Geneva, N. Y.

ZINC PRODUCTS EXHIBIT

Besides exhibiting the entire line of Zinc Products it manufactures, The New Jersey Zinc Company display at the coming Chemical Exposition will feature Rolled Zinc for building construction work. Booths 521 and 523 will be occupied by this concern.

Zinc Leaders, Eaves-troughs, Spanish Tiles, Flashings, Valleys, Fittings, etc., installed on an improvised portion of roof, will be displayed. Specimens of these articles in various shapes and styles will be shown.

Other Zinc products manufactured and sold by The New Jersey Zinc Company and the Mineral Point Zinc Company to be displayed, and their uses by numerous industries exploited, will include Zinc Oxide, Slab Zinc, Rolled Zinc, Zinc Dust, Albalith, Lithopone, Zinc Sulphate, Feathered Zinc, Salt Cake, Sulphuric Acid, Muriatic Acid, and Zinc Chloride.

Those who will represent The New Jersey Zinc Company at the display include W. H. Hendricks, A. B. Hervins, F. C. Ryan, S. C. Reynolds, F. W. Edwards, S. T. Ballinger, C. F. Beatty, H. W. Henderson and other sales representatives.

HUNGERFORD EXHIBIT

Brass, copper, monel metal and allied non-ferrous metals will be exhibited in various shapes and forms by the U. T. Hungerford Brass & Copper Company at the Seventh National Exposition of Chemical Industries to be held at the Eighth Coast Artillery Armory, New York City, the week of September 12.

In addition to their regular line of Star Brand Products, such as tubing, sheets, rods and wire, special attention will be invited to their complete line of manufactured articles, which include bolts, nuts, rivets, washers, nails, tacks, chain, fittings, etc. Their display of copper leader gutter and necessary fittings, as well as bronze and monel metal screen cloth will be of great interest to builders, architects and property owners, demonstrating the benefit of using copper in preference to other metals in building construction.

Those who will represent the U. T. Hungerford Brass & Copper Company include Messrs. John J. Dillon, Fred A. Kappelmann, John Parker and John W. Watt.

NEW LATH

A new product has been developed by The General Fireproofing Company, Youngstown, O., called Diamond Rib Lath for use in suspended ceilings or walls and in connection with Steel Tile and Steel Lumber floor construction. Diamond Rib Lath is similar to Self-Sentering and contains the standard Self-Sentering diamond mesh stiffened by cold drawn U-shaped ribs 4.8″ on centers and approximately ⅜″ in height. The mesh in Diamond Rib Lath forms a base and key for plaster while the ribs give it the strength necessary to span a wider spacing of supports than is common for ordinary flat laths.

All of the metal in Diamond Rib Lath, it is claimed, is effective reinforcing for the plaster thereon, and gives a firm, rigid plastering base requiring a minimum of mortar. All sheets are 24″ in width and in standard length of 8′, finished in 24, 26 and 28 gauges.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN ELECTROCHEMICAL SOCIETY

At the Fortieth Meeting at Lake Placid, in the Adirondacks, the features of the technical program for this meeting, September 29-October 1, are:

The Non-ferrous Metallurgy Symposium.

The Electrodeposition Symposium.

Session on Miscellaneous Papers (Not Included in Symposia).

They are planning to have the Symposia well represented and any member engaged along these lines of work is urged to contribute a paper. Manuscripts should reach the secretary's office by August 15.

Arrangements are being made for an interesting evening lecture, which would prove inviting to guests as well as members of the society. Moving pictures will further add to the diversity and entertainment of the meeting.

Lake Placid is recognized as a motoring center and tourists will find the combined trip to this Adirondack resort, with the attractions of the meeting, highly enjoyable. It is generally conceded that there is not another locality in America which can present the magnificent combination of mountain views, lakes and forests that Lake Placid does.

Plans are under way for a golf tournament which promises to come up to the success of the one held in Atlantic City. Mountaineering, boating and other sports will supply abundant entertainment. Don't fail to attend. Additional literature on the comforts of the Lake Placid Club and its recreative opportunities is enclosed.

BRITISH INSTITUTE OF METALS

BIRMINGHAM MEETING.

The following Papers are expected to be submitted at the annual Autumn meeting of the Institute of Metals, to be held in Birmingham on September 21-23:

(1) Professor A. A. Read, D.Met. (Cardiff) and R. H. Greaves, M.Sc. (Woolwich), on "The Properties of Some Nickel-Aluminium-Copper Alloys."

(2) R. T. Rolfe, F.I.C. (Bedford), on "The Effect of Increasing Proportions of Lead upon the Properties of Admiralty Gun-Metal."

(3) R. Genders, M.B.E., B.Met. (Woolwich), note on "The Casting of Brass Ingots."

(4) T. G. Bamford, M.Sc. (Birmingham), on "The Density of the Zinc-Copper Alloys."

(5) F. Johnson, D.Sc. (Birmingham), on "Experiments in the Working and Annealing of Copper."

(6) W. E. Alkins, M.Sc. (Manchester) and W. Cartwright (Buxton), on "The Effects of Progressive Cold-Drawing upon Some of the Physical Properties of Low-Tin Bronze."

(7) R. Genders, M.B.E., B.Met. (Woolwich), on "The Extrusion Defect."

(8) F. S. Tritton (Teddington), on "The Use of the Schleroscope on Light Specimens of Metals."

(9) D. H. Ingall, B.Sc. (Birmingham), on "The Annealing of Rolled Zinc."

(10) D. Hanson, D.Sc. (Teddington) and Miss M. L. V. Gayler, M.Sc. (Teddington), on "The Constitution and Age-Hardening of the Alloys of Aluminium with Magnesium and Silicon."

(11) F. Adcock, M.B.E., B.Sc. (Sheffield), on "Electrolytic Etching of Metals."

(12) S. Beckinsale, B.Sc. (London), note on "Electron" (the high magnesium alloy).

Papers will be presented and discussed at the morning sessions, the afternoons being devoted to visits to works and the evenings to social events, including a reception by the Lord Mayor, and a garden party, while to conclude the meeting there will be a motor trip to Kenilworth, Warwick and Stratford-on-Avon.

A ballot for the election of members is now being arranged for the convenience of those persons who desire to participate in the Birmingham meeting. Full particulars can be obtained from the secretary, Mr. G. Shaw Scott, M.Sc., 36 Victoria street, London, S.W. 1.

BRIDGEPORT BRANCH, A. E. S.

The Bridgeport Branch will hold an outing at "The Farm," Black Rock, Bridgeport, Conn., on Saturday afternoon, September 10, 1921. Bathing, tennis, bowling, baseball, dancing and a shore dinner will be the business of the day. Visitors from outside branches are welcome. Write to Louis J. Maraffi, Box 671, Bridgeport, Conn., for tickets.

CHICAGO BRANCH, A. E. S.

The Chicago Branch, on July 9, held the regular monthly meeting and for this occasion engaged the Hardware Club of Chicago, through the courtesy of the vice-president, W. G. Bott, and the returning visitors from the convention dropped in upon them.

The meeting was called to order by George Burt and the minutes of the previous meeting were read and approved. The regular order of paying of the bills followed and two new applications were received and one request for a transfer, which was granted.

At this time President Burt invited Dr. Gailey (Miss E. Z. Jenks), our honorary member and the only woman member of the A. E. S., to a seat on the rostrum, and then turned over to her the gavel and asked Dr. Gailey to preside over the meeting for the remainder of the evening.

At this time one member, S. E. Huenefauth, approached the president's station and in a very appropriate speech presented the honorary presiding officer with a beautiful bouquet of flowers on behalf of the members of Chicago Branch A. E. S. In his talk he complimented Dr. Gailey upon her knowledge and advancement in the science of electro-chemistry, also for her service to the Government during the war, and expressed the gratitude of Chicago Branch A. E. S. in having among its members such a distinguished young lady.

Dr. Gailey responded in her usual eloquent and captivating way and (as only Dr. Gailey knows how) expressed her appreciation of the honor bestowed upon her by the Chicago Branch. She also expressed her respect for and interest in the A. E. S. and hoped to see the 1930 convention come to Seattle, her home town.

Dr. Gailey then brought down the gavel and said, "Let's get down to business." When she called for report of the committees, a motion was made and carried that, on account of a number of distinguished visitors being present, from whom we would want to hear, the report of the delegates on the convention be laid over until next meeting.

Under the head of new business, a motion was made and carried to send to our secretary, F. J. Hanlon, a bouquet of flowers, as he was taken ill with appendicitis and confined to his bed.

The temporary president, in regular form, just like our own president, turned the meeting over to the librarian, who had quite a few questions to put up to the meeting, and the way our Dr. Gailey waded into them makes us wish that she lived in Chicago and not Seattle. Some day either she or Seattle will have to come closer to Chicago.—F. J. Hanlon.

INDIANAPOLIS BRANCH, A. E. S.

THE PICNIC

Sunday, July 31, the Indianapolis Branch gave a basket picnic for the members and their families at Walnut Grove, 21 miles southeast of Indianapolis on Sugar Creek.

It proved to be a delightful day for everybody from start to finish. We can justly feel proud of our ladies, who kept things livened up, and especially Mrs. Harry Maze, who had charge of arrangements and saw that there were no

dull moments. On arriving at the Grove, and before everything was unloaded, Hal Warner and L. Mertz grabbed their fishing rods and sneaked down the creek, making a secret vow they would have fish for dinner. While Mertz was content to bait his hook and cast out into the stream and wait, Warner used a wooden minnow, casting right and left to no avail, and still wonders why those German carp did not strike that minnow. Well, there were no fish for dinner. The bathing beach was pretty well patronized and it was noticed that Ben Aufderheide has a little tot of a girl who is a comer when it comes to swimming. Miss Lamoureux can sure shoot the chutes, and when she hits the water the others bathers sure know it (some splash!). Mrs. Hennesey is still sore at Richard for not going bathing with her, but he would rather play cards than swim. After a very good dinner, marred by nothing but Hennesey spilling the beans and Dry Beer on Hoffman, we retired to the ball-grounds to play ball, and I wish to say it was a treat to see the ladies play with the men. They may talk about Babe Ruth, but Mrs. J. Walsh can walk all around him in batting and rooting and she takes the prize when it comes to running.

Mrs. Ormsby and Mrs. Aufderheide complained about the bat being too small to hit the ball with, so we will furnish them with tennis rackets next time. The score was 7 to 1 in favor of the Stiff Knees. After the game we had a water melon contest, with F. McDonald in the lead and J. Vehling second, McDonald winning, as Vehling had to stop because the seeds tickled his throat. After a couple of hours of more pleasure, we made ready to go home, everyone feeling that the day was well spent.

The Branch held its regular meeting August 13, with President Hennesey presiding over a fairly good attendance.

We were pleased to have our Kokomo member (Mr. Boyd) with us, who reported business as being fairly good in his city. The main topic of the evening was our picnic, held recently, and from the drift of the talk it must have done a world of good.—L. Mertz.

NEW YORK BRANCH, A. E. S.

The regular meeting was held August 26 at the Broadway Central Hotel, attended by 28 members. The Welfare Committee reported that it had arranged for an outing to be held at City Island, New York, September 25.

Discussion was held on the following problems: Black Nickel, Copper Deposition, Brass Plating, Bronze Plating and the Use of Bisulphite of Soda in a Brass or Copper Solution.

WISCONSIN FOUNDRYMEN'S ASSOCIATION

E. M. Kobow, Chain Belt Company, Milwaukee, Wis., was elected president of the Wisconsin Foundrymen's Association at the 43rd regular meeting, held at the Milwaukee Athletic Club, Milwaukee, Wis., July 26. Mr. Kobow has for the past ten years been prominently associated with foundry work in Wisconsin. A unanimous ballot was cast for each of the following officers:

E. M. Kobow, president, Chain Belt Company, Milwaukee, Wis.

Scott, Mackey, 1st vice-president, Stowell Company, South Milwaukee, Wis.

Wm. J. Grede, 2nd vice-president, Liberty Foundry, Wauwatosa, Wis.

J. H. Biever, 3rd vice-president, J. E. Gibson Company, Port Washington, Wis.

J. L. Wurm, financial secretary, R. J. Schwab & Sons, Milwaukee, Wis.

C. E. Schwab, director, R. J. Schwab & Sons, Milwaukee, Wis.

J. C. Bracket, director, T. L. Smith Company, Milwaukee, Wis.

The above named officers were elected to their respective offices for the ensuing year.

This association was organized to promote better ways and means of figuring and developing cost methods, and to increase foundry efficiency. The association has experienced a conspicuous growth during the past few years and at the present time is launching a campaign throughout the State of Wisconsin to increase its membership.

NATIONAL CHEMICAL EXPOSITION

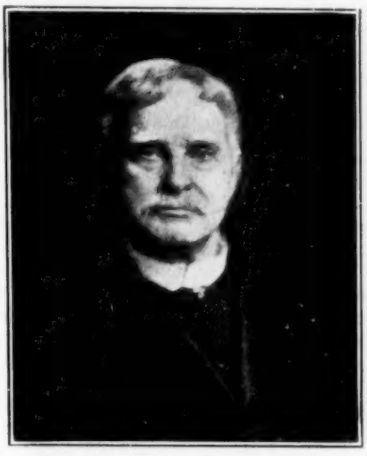
The Seventh National Chemical Exposition, the preliminary arrangements for which were described in our August issue, will be held the week of September 12 at the Eighth Coast Artillery Armory, New York. For information write to the National Exposition of Chemical Industries, Suites 706-707, 342 Madison avenue, New York, N. Y.

PERSONALS

Bradley Stoughton, having resigned after more than eight years' service as secretary of the American Institute of Mining and Metallurgical Engineers, will resume his practice as a consulting engineer, making a specialty of financial investigations and reports to bankers, investors, directors, trustees and examining accountants on industrial plants, engineering enterprises, iron and steel plants, etc. His office will be at the Engineering Societies' Building, 29 West 39th street, New York City, until October 1.

E. S. Crosby, sales and advertising manager for the United States and Cuban Allied Works Engineering Corporation, has resigned to become manager of the Eastern District of the Celite Products Company, producers of the Sil-O-Cel insulating material, and Filter-Cel the filtering medium. Previous to his service in France with the army, he was assistant sales manager for the De Laval Steam Turbine Co., of Trenton, N. J. Mr. Crosby will make his headquarters at 11 Broadway, N. Y.

At a meeting of the directors of the Bridgeport Brass Company in Bridgeport, Conn., **Carl S. Dietz,** president of the Norton Company of Worcester, Mass., was elected president and



F. J. KINGSBURY

general manager in place of **F. J. Kingsbury,** who has been president, and of **Guy P. Miller,** who has been treasurer and general manager. Mr. Kingsbury resigned to become chairman of the board of directors and treasurer of the organization. Mr. Miller also resigned, but remains on the directorate. The resignations and elections became effective on September 1.—Boston Transcript, August 26, 1921.

DEATHS

James Sweeney, a retired manufacturer of nickelplate ware in Brooklyn, died August 23 at his home, 1253 Dean street, Brooklyn, in his seventy-fifth year. Mr. Sweeney was a trustee of the Prudential Savings Bank and last year was one of the delegates to Europe for the Knights of Columbus on their visit there.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

SEPTEMBER 1, 1921.

What is generally conceded will be of incalculable benefit to Waterbury and its industries, is the Copper and Brass Research Association, recently organized in New York, and which will have its business headquarters at No. 25 Broadway.

Waterbury, the brass center of the world, is personally represented in the association by **Fred S. Chase,** president of the Chase Companies, who has been elected one of the vice-presidents of the association. Thus far, local business membership in the organization is confined to the **Chase Metal Works Company,** the **Chase Rolling Mills Company** and the **Scovill Manufacturing Company.** Mr. Chase has been directly connected with and greatly interested in the forming of the association.

The ultimate aim of the new association, as set forth by Waterbury men prominent in the brass industry, is to educate the public to the advantages of buying products manufactured of copper or brass, rather than the substitutes that found their way to the markets during the war. One prominent manufacturer stated: "We, in Waterbury, are especially interested in this amalgamation of interests because it means bread and butter to us. The city is built around its brass industry. Naturally if the buying public is brought to learn of the real value and lasting qualities of copper and brass products they will insist on purchasing products which will indirectly bring a greater volume of business to this city. During the war the price of copper, which with zinc forms the foundation of brass, soared sky high. People were encouraged to buy hardware made from cheaper materials, and of less lasting qualities.

"Copper is now selling for less than for several years before the war. Brass is cheap, and we can therefore sell real copper and brass products within the reach of everyone."

Advertising is one of the mediums which will be resorted to in the campaign of educating the public.

UNEMPLOYMENT STILL SERIOUS

Manufacturers of the city are taking a keen interest in the city's problem of caring for the unemployed. Recently at an aldermanic meeting several of the most prominent manufacturers were present, including **E. O. Goss,** president of the **Scovill Manufacturing Company, Frederick S. Chase,** president of the **Chase Companies,** and **John A. Coe,** president of the **American Brass Company.** The session was devoted chiefly to reports from the manufacturers regarding the possibility of increased activities among the shops this fall. Available reports of the meeting indicate that the factories hold out no immediate hopes of taking care of the present numbers of unemployed. Manufacturing at this time, it was said, was confined for the greater part to replenishing warehouse stocks. It is believed that even should large orders begin to arrive at the factories, these stocks on hand would prevent much work being available for some time to come. One manufacturer is credited with the statement that during the past six months his factory could have taken care of current orders by working only one hour a week.

Several days after this meeting **John H. Goss,** general manager of the **Scovill Manufacturing Company** issued a newspaper warning against over optimism for the next few months. It is believed that Mr. Goss' statement was prompted by a report that his concern had received enough orders to put it on a full time basis. Mr. Goss said that it would be wrong to encourage local workers with an optimism for the immediate future which was not based on present actual conditions. He believes that the city faces a hard winter during which the industrial world will be struggling to get back on its feet. Experts, he pointed out, believe that it will be a full year before "normalcy" heaves into sight.

"General conditions are not without their brighter side, however," Mr. Goss said. "We have noticed a return of buying confidence which is expressed in a more sincere purpose of inquiries of prices. People are evidently buying more than they did two months ago. Manufacturers are in general trying to uphold the present wage scale and would like to see wages at a higher rather than a lower level. At present, like practically all industries, we are quoting prices which represent less than the actual cost of production. In general, I think that the fall will see an improvement in local conditions, but it will not be such as will warrant the spending of a single dollar foolishly while the city is going through a period of such depression."

TARIFF AFFECTS WATERBURY

The Fordney protective tariff bill, which has still to fight its way through the Senate, has much in it of vital concern to Waterbury. It has a special interest in this city because of its concern with metals, the manufacture of which is the chief industry of Waterbury. The **Waterbury Clock Company,** a large user of brass, is vitally concerned in the bill in another department.

One of the business romances of the war is built around the Waterbury Clock Company. The story hinges around its watch crystal department, which has developed entirely since the company was completely cut off from its usual sources of foreign supply shortly after United States entered the war. After much experiment in an entirely new field of endeavor, new not only to Waterbury, but throughout the United States, the company succeeded in turning out watch crystals on a commercial basis—the only concern in America to do so. But only to be doomed by post-war competition from abroad. The crystal department of the factory has now been idle for months. But with the 40 per cent tariff provision in the proposed bill, it is hoped that the new and otherwise successful industry will not be entirely wiped out.

Other Waterbury factories will be materially benefited by other provisions in the tariff bill, should they finally pass the Senate. These include a protective rate on numerous articles manufactured from brass, including belt buckles, pins, fasteners, hooks and eyes, knives, scissors, razors, razor blades, scientific instruments, tools, watch movements, clock movements and numerous other copper and brass products.

H. G. N.

NEW BRITAIN, CONN.

SEPTEMBER 1, 1921.

For small favors local manufacturers are now very thankful and an order for $80,000 worth of hydraulic speed gears has sent joy to the hearts of the **New Britain Machine Company** officials. The **Waterbury Tool Company,** formerly located in this city but now of Waterbury, has received a contract from the navy department for a series of special hydraulic gear shifts that are used in lifting, lowering and revolving the big turrets, ammunition hoists, etc., on the modern dreadnaughts and it is a sub-contract of this order that the local concern has obtained. The Machine company, still running with a skeleton force, is doing a little more business in its automatic screw machine line.

Elsewhere about the city business remains unmistakably dull. The **P. & F. Corbin Division** of the **American Hardware Corporation** which for several months was operating on a 32 hour basis has now increased its working schedule to 40 hours per week. On the other hand however, it has so reduced that rate of wages that the employes are earning no more, and some not as much, as under the shorter hour plan. At the **Corbin Cabinet Lock Branch** of the American Hardware Corporation some individual departments are rushed with orders. This is particularly true of the pad-lock departments. At the **Russell & Erwin Division** a reduced payroll is aiding the company to weather the financial storm and at the **Corbin Screw Corporation,** while a 50 hour week is in effect, business is not very brisk and as soon as the

stockrooms are filled a curtailment in working hours may be expected.

The **Landers, Frary & Clark Company** has resumed operations after a two weeks' shut-down and the **Union Manufacturing Company** has also just reopened following a fortnight of idleness. During the last two weeks of the month the **Stanley Rule & Level Company** was shut down entirely.

It would take a better and brighter prognosticator than any of the local manufacturers claim to be to predict what the Fall and Winter months will bring forth, but at present writing every indication points to a dull Winter, with a scarcity of work. H. R. J.

TORRINGTON, CONN.

SEPTEMBER 1, 1921.

Almost imperceptible improvement is noted this month in general industrial conditions in Torrington, especially insofar as the metal industries are concerned. Some departments in some of the shops have slightly increased their working schedules, though there has been practically no change to speak of in the number of workers employed. Prices have been cut to the bone but such orders as are coming through are for the most part small.

The normal labor capacity in the metal industries in Torrington is approximately 6,000. The number actually employed now is 4,100, only a small part of whom are working on full time. About forty per cent it is said are working 50 hours a week; and about twenty per cent 55 hours per week.

The sales forces of one or two of the plants, it is said, are planning concerted drives for new business after Labor Day, with the vacation season closed. Unreceptivity of dealers during the Summer months discouraged the beginning of such a drive any earlier.

The spirit of pessimism which prevailed in many circles during the middle of the Summer is being succeeded by a more optimistic spirit and the prediction is now being freely made by those in close touch with the situation that there will be a noticeable improvement in conditions by the middle of October. J. H. T.

HARTFORD, CONN.

SEPTEMBER 1, 1921.

The metal industries in Hartford are marking time pending the resumption of activity in other industrial branches to which Hartford factories act as feeders. Hartford factories make parts and tools that cannot be marketed direct in the trade but must await demand in other branches where they are used in making or completing other products. This condition, bank officials here say, is the chief reason why there has been no increase in the size of factory payrolls. Local industries are more or less indirectly, and therefore more slowly, affected than in many other industrial cities.

Four large factories reopened at the beginning of the week of August 15 after the annual vacation shut-downs of from ten days to two weeks. One of these, however, the **Royal Typewriter Company,** only ran three days, then closing its plant until September 6. "Present business conditions, increasing stock and heavy taxes to meet" are given, in a statement by the company, as the reasons for the suspension.

The other three concerns, the **Pratt & Whitney Company,** machinery manufacturers, **Colt's Patent Fire Arms Manufacturing Company** and the **Underwood Typewriter Company,** resumed work with no change of hours or number of employes. The Pratt & Whitney company is running its plant three days a week; the Underwood, four days of nine hours each, and Colt's, five and one-half days of nine hours each.

Orders to take back all men who had been laid off during the past nine months at the **East Hartford Shops** of the **New York, New Haven & Hartford Railroad** were issued August 11. The men, between 350 and 400 in number, were taken back in groups, under the seniority rule, and on August 23 it was announced that the force at the shops was 100 per cent. strong.

About 2,500 men in Hartford are in need of work, according to the city's unemployment committee. The city government and the chamber of commerce have been co-operating in relieving the situation, and since the first of the year a total of $37,500 has been appropriated for extra public work, chiefly in the park department, to provide jobs. All but $4,500 of this has been spent.

The **Netherland Aircraft Corporation** of Amsterdam, Holland, makers of the war-famed Fokker planes, is seeking a manufacturing center in America, and on August 6 sent representatives to Hartford in a Fokker, piloted by Bert Acosta. Brainard field, the municipal aviation ground, and a part of the Colt factory were inspected. Nothing definite was decided upon, it was said. W. A. L.

ROCHESTER, N. Y.

SEPTEMBER 1, 1921.

Until the Fordney bill becomes a law the big metal using manufacturing plants of Rochester have not the remotest chance of a return to normal business conditions. Activities in all of the larger concerns are at a low ebb, and there are no indications that point to improvement. The passage of the Fordney tariff law is awaited with a great deal of anxiety, and even though the new law may become effective before the beginning of the Winter season, its benefits will hardly become apparent before next Spring. Consequently the outlook for marked improvement in business conditions is not anticipated in many months.

The demand for metals in Rochester is very slow and a quiet market results. Purchasing agents have been busy only in checking up their surplus supplies of late, and little in the way of buying has taken place. Railroad conditions are excellent now, and deliveries at practically normal.

Bausch & Lomb optical works, which suspended two weeks in July for purposes of inventory, resumed operations early in the present month with a force of 3,000 operatives. The vacation was twice as long this year, owing to the intense hot weather and poor business conditions. Members of the firm are in an optimistic state, however, and while they realize that there is no prospect of an immediate resumption of activity it is felt that eventually a return of prosperous times will be here.

The **Reliance Foundry Company** has filed a petition in bankruptcy, with liabilities of $3,484 and assets of $1,133.95.

The strike in the building trades is over, the men having been forced to accept a 15 per cent. cut by an arbitration committee. With a resumption of active building operations, which have been suspended since April 1st, the demand for all metals ought to be greatly stimulated, particularly steel, lead, tin, brass, and zinc. G. B. E.

ROME, N. Y.

SEPTEMBER 1, 1921.

There are indications of returning prosperity in the Rome manufacturing plants. The **Rome Metallic Bedstead Company** is running full time, having about all of their regular employes again at work.

The tube department of the **Rome Manufacturing Company** is busy, due to the increasing demand for tubes for metallic beds. Inquiries from bedstead manufacturing companies throughout the country regarding trimmings for beds are increasing, indicating that the picking up of business is looked for in the near future. One strange thing is that the wash-boiler department of this concern is particularly busy, there being quite a demand for copper boilers.

There is a force of 400 men at the main plant of the **Rome Manufacturing Company,** as compared with 800 last November, but hopes are entertained that many more of the regular employes can be taken back before long. At the **Rome Locomotive Works,** a branch of the Rome Manufacturing Company, there are but 50 men working, as compared with 250 during prosperous times. There is, however, a prospect of a large amount of work being secured for this plant, which will keep the shop busy for a long time.

At a joint meeting of the directors of the **Rome Hollow Wire & Tube Company** and the **Rome-Turney Radiator Company,** held on Thursday afternoon, August 25, a deal was

consummated whereby the Rome Hollow Wire & Tube Company purchased the entire plant and business of the Rome-Turney Radiator Company, the directors of the latter company immediately resigning and the directors of the former company taking charge. The new directors of the radiator company are F. J. De Bisschop, Barton Haselton, Hon. John D. McMahon, James A. Spargo and F. M. Shelley. The retiring officers of the Rome-Turney Radiator Company are Dr. W. L. Kingsley, president; Barton Haselton, vice-president; George W. Turney, treasurer; William L. Lynch, secretary, and Harry W. Gerwig, assistant secretary.

In an interview **George W. Turney** said that he is going to California for his first vacation. He has been in active service 54 years without relaxation or vacation. For many years day and night he has devoted time and thought to the manufacture of radiators, in the manufacture of which he has succeeded. He is still a very active man and although he appears as a man of about 50 years he is really 67 years old. He will be accompanied to California by Mrs. Turney and their two daughters, Catherine and Elizabeth. Mr. Turney is a stockholder in the Rome Brass & Copper and Rome Manufacturing Companies. He has no definite plans for the future, beyond taking a long vacation in California.

M. J. D.

PROVIDENCE, R. I.

SEPTEMBER 1, 1921.

It has been many years since there have been so many persons in this State out of employment as at the present time and with little prospect of any material improvement in conditions for the immediate future at least. Every line of industry is affected as well as every branch of business. With the high schedules of wages the manufacturers are unwilling to push production and accumulate stocks in hand because of the uncertainties of the future. Because of the high price of goods the wholesalers are not placing any orders and through lack of demand from the public the retailers are deleting their stocks to the lowest possible ebb. And so the story is told. What the solution is to be no one seems willing to hazard.

Manufacturing jewelry business, which at this time should be showing signs of activity for the holiday trade, is practically at a standstill with little or no prospect. Some of the older manufacturers shake their heads and talk about the "hard times of '73," but the younger members of the trade are more optimistic and advocate "starting something."

According to a special report that has just been issued by the Boston Chamber of Commerce, Rhode Island, which between 1909 and 1914 had actually lost in the number of factory wage earners and also in its value of products, reversed step and showed a gain of more than 25 per cent. in the number of persons employed in manufacturing pursuits from 1914 to 1919. But it must be borne in mind that this period was during the five years that every line of manufacturing industry, especially in all metal lines was being driven to capacity of war and wartime orders.

The report, it is stated, was made following a study of the industrial situation in New England to determine whether reports that the section was losing its supremacy in this field were justified. It is declared in this report that to the contrary, New England is holding her place in business and manufacturing and that she "can have confidence of continued development, for a section which has held its place during so many decades will be able to meet new problems as it has in the past."

H. J. Astle & Company of this city has recently installed a Boland four-head polishing bench and dust collecting system in the manufacturing jewelry establishment of the Hadley Co., 21 Eddy street this city. The concern has also just shipped two Boland polishing benches to Japan. W. H. M.

TRENTON, N. J.

SEPTEMBER 1, 1921.

Business has taken a turn for the better at the Trenton metal plants and the concerns are increasing the working force and extending the number of hours of employment. The big **Jordan L. Mott Company,** which some time ago was compelled to cut the time down to but one and two days a week, is now operating with a full force again. Some of the departments are operating five days a week, while others are running five and a half days. A number of orders were recently received and these will keep the plant in operation for some time.

The **John A. Roebling's Sons Company** is working on changes and improvements in the copper wire and electric galvanizing end of the business. To take better care of this branch of the industry it is planned to have a new building constructed at the South Trenton plant. The building will be approximately 500 by 850 feet in size, 4 stories, and will represent an outlay of about $200,000. Plans are now being perfected for the new building.

Under the reorganization plan of the **Mercer Motors Company,** Trenton, N. J., effected recently, preparations are now under way for resuming operations of the plant at Trenton. The officials of the new company have now taken hold and are working out plans under which the plant will operate. T. E. A. Bartel is the new vice-president and general manager, while J. W. MacMorris is the general superintendent. William A. Smith has been made general sales manager. He was formerly manager of the Mercer Company's branch in Philadelphia and was one time with the Hare's Motors in New York. An experienced engineer will shortly be added to the staff.

The **Keystone Watch Case Company,** of Riverside, N. J., which suspended operations last June, has reopened its plant with a force of 1,000 hands. All the departments are now in operation.

National Metal Products Company, of Clifton, N. J., has been incorporated at Trenton with $50,000 capital stock to manufacture metal products.

The **General Sheet Metal Works,** of Newark, N. J., has been incorporated by Samuel Kinland and others of Newark, to manufacture sheet metal goods. The company will have a factory at 150 Broome street, Newark.

Universal Stamp Works, Inc., of Newark, N. J., has been incorporated with $100,000 capital to deal in metals.

The **Comfort Safety Razor and Novelty Company,** of West Hoboken, N. J., has been incorporated to manufacture cutlery, etc.

The Safety Auto Lock Company, of 31 Clinton street, Newark, N. J., has been organized by William J. McCroy, of 7 North Tenth street, to manufacture locks, etc.

Sterling Watch Company, Inc., of West Orange, N. J., has been incorporated at Trenton with $200,000 capital to manufacture clocks.

E. E. Steiner & Company have leased the factory building at Avenue C and Harper street, Newark, N. J., and will use the building for the manufacture of portable ovens and sheet metal.

The estate of the late **Ferdinand W. Roebling,** president of the John A. Roebling's Sons Company, according to an inventory filed with the Surrogate at Trenton, N. J., is valued at $10,460,337.17. In addition to the property inventoried, Mr. Roebling left real estate valued at $242,550.

Oliver O. Bowman, treasurer of the **Jordan L. Mott Company,** on August 23 celebrated his 84th birthday at his home at Trenton, N. J. He gave a quiet dinner party at his home to a number of relatives. Mr. Bowman, despite his advanced years, is enjoying fine health and is as active as most men many years his junior. He has been engaged in the manufacturing business in Trenton for the past fifty years, being one of the few Trentonians who started in business a half century ago and is still going strong. Mr. Bowman is also president of the Broad Street National Bank, Trenton, and spends 10 and 12 hours daily attending to business at the bank and the Mott plant. C. A. L.

BALTIMORE, MD.

SEPTEMBER 1, 1921.

Baltimore coppersmiths are skeptical in relation to a recent story appearing in New York papers describing the redis-

covery of the art of tempering copper, lost since the time of the Roman Empire. Joseph Kavanaugh commenting on the story said: "There have been many thousands of experimentors who have claimed to discover how to temper copper and in laboratory experimental work seem to have succeeded, but when the theory was applied in a practical way it failed to work out. We have had this demonstrated in our own works. The process seemed to work out alright on small copper wire, but it could not be made to work on bars or for practical application."

A large shipment of graphophone cabinets has been received by the **Columbia Graphophone Company** at its new plant at Orangeville. The motors will be installed at the local plant and the complete graphophone will be distributed in this territory.

Brighter spots are appearing in the industrial skies, according to **J. M. Jones**, president of the **Eastern Rolling Mills**, which have encouraged manufacturers to believe that business will eventually get better. Mr. Jones states that inquires for products are increasing, and while no great amount of actual business has so far developed, the mere fact that prospective purchasers are taking the trouble to inquire as to prices gives hopes that orders will be placed later.

The **Floatless Carburetor Corporation** has been organized with a capital of $100,000 by F. S. Orem, Claude R. Hays and R. Contee Rose to exploit an invention.

Special entertainment, bathing and other attractions last week marked the first annual outing of the **Baltimore Retail Hardware Dealers' Association** at Bay Shore Park. A chicken dinner was served and dancing furnished entertainment at night. **Ernest Johannesen** is president of the Association.

W. J. L.

ST. LOUIS, MO.

SEPTEMBER 1, 1921.

A slump in both the brass and metal foundry industry and the plating industry that appears serious in many of its aspects is reported by St. Louis concerns, with but a very few exceptions. These exceptions are among the smaller plants which have about a normal supply of work on hand, and are little affected by the cessation of manufacturing by many of the large hardware, automobile, accessory and similar industries. While jobbing is active, this is about the only branch of work where a satisfactory level is maintained, it is said.

Although the local plant of the **General Motors Company** has been shut down for some months, **G. S. Mott**, vice-president of the corporation has assured the Chamber of Commerce that there will be no attempt to sell any part of the $3,000,000 structures recently erected. It is the hope of the company to reopen some units of the factory when the present inactivity of business is overcome.

The **Moon-Hopkins Billing Machine Company**, 2506 Mullanphy street, which manufactured a combination typewriter and bookkeeping machine and employed from 150 to 200 men, was sold during the month to the **Furroughs Adding Machine Company**, of Detroit, and the plant here vacated. The machines will now be turned out at the Detroit factory. The company, although capitalized at $2,500,000 when organized in 1907, was sold for $750,000, it was reported. The reason for the sale was said to be the lack of local financial support.

The **More-Jones Brass Company** reports a small volume of business for the month with but slight prospects of an improvement in the fall. The company does casting for railroad supply houses, and for rolling equipment. Railroads are buying little or no stock at this time, and a complete revival of the transportation trade will have to be accomplished before the firm regains the usual volume of business, it is said. The **Modern Brass Foundry** specializing in job casting reports a noticeable slump in machine shop work. Prospects for a good summer's trade were not fulfilled, it is reported.

The **Musick Plating Company**, one of the largest platers in the West, also reports but a light trade. While the present volume of business is about equal to that of the same period in 1917, still with the increased cost of labor it is felt that a larger volume will be necessary to maintain a healthful condition. A marked falling off in accessory and hardware work has been noticed during the summer, and the slump in all manufacturing has hurt the platers, according to **Fred Musick**, one of the proprietors. The **Kretzer Manufacturing Company** also feels dissatisfied with present conditions, but is hopeful that by the first of the year the readjustments will have been completed.

The **St. Louis Platers Supply Company** has enjoyed a good summer's business which is credited to the advantageous prices at which plating supplies may be bought. It is confident that the plating trade will improve steadily as a demand for hardware and machinery is revived. Platers are for the most part optimistic, the members of the firm declare.

W. G. R.

INDIANAPOLIS, IND.

SEPTEMBER 1, 1921.

In the standardization of electroplating as to the uniformity of deposit and as to the amount of mineral solution, the voltage and amperage used, **B. D. Aufderheide**, president of the **Indianapolis Electroplating Company**, has cited examples as to the wide difference in the quality of electroplating that at present is being produced. The company's plant and offices are situated at Kentucky avenue and Merrill street. Mr. Aufderheide stated that perhaps no other industry offers a larger opportunity for low-grade work than does the electroplating industry.

Electroplating that will stand the usage for which it was intended over a long period—a high character of work of uniform deposit—Mr. Aufderheide declared can be produced, and for service over a long period at a good saving compared with poorly executed work that in a short time must be duplicated.

Charles P. Rush and **John P. Ritchie**, under the name of the **Elwood Pattern and Castings Company**, have closed a lease with the **Union Traction Company** for the buildings formerly used as car barns in the eastern part of Elwood, Ind., and have started the work of getting them in readiness for a new factory to manufacture brass aluminum and other casting and wood and metal patterns. They will buy an outfit of machinery at Indianapolis.

The **Pioneer Brass Works**, of this city, will be one of the exhibitors at the industrial show to be held under the auspices of the Chamber of Commerce in October. The show is being staged for the benefit of Indianapolis manufacturers and only products made in Indianapolis will be exhibited. The show will be one of the largest of its kind ever held here.

Announcement was made today that **Arthur R. Baxter**, president of the **Keyless Lock Company**, and **L. C. Huesmann**, president of the **Central Supply Company**, manufacturers in Indianapolis of plumbers' supplies, are part of a group of prominent Indiana men to take over an important part of the stock of the **Fletcher American National Bank**. The bank is probably the largest and most influential financial institution in the state. The stock was purchased from Stoughton A. Fletcher, president of the institution, whose ancestors founded the bank.

Notice has been given by **Wm. O. Dunlavey**, receiver for the **Russell Metal Production Company** of Indianapolis, that all the property and other assets of the company will be sold at receiver's sale soon.

The **Lavelle Foundry Company**, at Anderson, Ind., has increased the number of its directors from three to seven.

The **Columbus Foundry Company**, at Columbus, Ind., has increased its capital stock from $1,500 to $35,000.

E. B.

DETROIT, MICH.

SEPTEMBER 1, 1921.

Business conditions in Detroit and vicinity have changed considerably for the better within the last thirty days. More optimism is expressed than has been heard for a long time. Of course the automobile business is the mainstay of everything here at present, but improvement is beginning to show

in other lines, which of course includes the brass, copper and aluminum field. In a report just issued by the **Ford Motor Company,** this concern is shown to have manufactured and sold more cars within the last two months than ever before in its history. Other plants, with the exception of course of a few small ones which have been living from hand to mouth for many months, find their business also increasing. But, notwithstanding this fact, it is well to bear in mind that no sane purchasing agent is stocking up in anything. It is a case of buying from hand to mouth. This is true in every line, and particularly so in the automobile and accessory business. Inventories are very low at present and no doubt will continue so for a long time to come. In fact it is believed that in the future there will be no such stocking-up as in the past. For instance, the Ford Motor Company's taxes in Highland Park were reduced $24,000,000 in July simply because the company had reduced its inventories to that extent. All the big automobile, accessory and aluminum concerns are doing the same. Much of the surplus realized in this way is being used to pay up outstanding obligations. Many a concern has pulled itself out of a hole by doing this very thing. Henry Ford admits it helped him out of a tight place a few months ago. It does not pay, he says, to carry heavy inventories in such times as these.

The **Detroit Employers' Association** reports this week that more men are employed in Detroit at present than at any time since last fall. This shows in itself that business is improving. The future does not look near so discouraging as it did thirty days ago.

A general survey made in Detroit among the brass, copper and aluminum plants within the last few days reveals a most optimistic spirit. While but few of the plants outside the general automobile concerns are working full time, practically every person interviewed states that he believes the worst of the dull period is past and that the business world is on the mend. It develops that business is showing a gradual, but certain upward trend.

Secretary Grant, of the **Employers' Association,** to whom about 80 per cent. of Detroit employers report weekly, shows by his chart that the line which has run along all summer in an almost straight line, and far below the average of one year ago, is bending upward, indicating that more men are being employed at present than for several months. But he says this is not a certain indication that the bend will continue to climb. He is, however, practically the only one who studies business conditions, to express uncertainty. The automobile buying season is about over, he says, and it is possible the big plants may be forced to curtail. But it is not believed by many that the automobile business is going to show much of a drop—in the manufacturing end at least. Buying may not be so brisk for a time a little later on, but it is apparent the big plants are going to resume before long on the next year's models.

Detroit Copper & Brass Rolling Mills: Mr. A. J. Peoples, secretary and treasurer, says his company is now working about 60 per cent. of its regular force of 1,000 men. Everyone is on full time. He reports a considerable improvement in a certain line relating to the building trade. He can account for this in no other way than that building conditions must be on an upward trend. In general, he seems optimistic regarding the future.

Pemberthy Injector Company: This company at present reports a 45-hour week and at present is working about 115 men. The normal number is about 600 While this is considerably lower than the number the company usually employs, optimism is expressed for the future.

American Injector Company: This concern reports about 40 men working and is not very enthusiastic over the future. This is about half the number usually employed. Some are working only three days a week.

Acme Brass Works: This company is working full time, nine hours a day. About 50 men are employed, which is an average normal number. The future is reported encouraging. This concern manufactures gas and plumbers' supplies.

General Aluminum & Brass Manufacturing Company: This company is working about 50 per cent. of normal. Its managers express optimism for the immediate future. It produces largely for the Detroit automobile plants, which indicates that the vehicle industry also has good prospects.

Capital Brass Works: This plant reports employing about 200 men out of a normal number of 400. While a falling off in business was reported for May and June, conditions improved through the summer, and indications now are that business is picking up. The future is thought more favorable than for several months.

Roberts Brass Manufacturing Company: This concern reports about 160 men working, as against about 600 in normal times. Some are working five and a half days, and a few only three days. It compares present conditions to the stock market. One day trade is up and encouraging, while the next it is down. In general, however, the outlook is thought favorable.

Economy Brass Corporation: This company notes just a slight improvement in conditions. It is working full time, but with only a small number of men.

Moynahan & Duchene: This concern reports working from 25 to 30 per cent. of normal and full time. Mr. Duchene says that competition is keen and bidding close. Everyone is out for business and many are bound to get it no matter what the profit may be. He believes future conditions are fair.

Wolverine Tube Company: An optimistic expression also comes from this concern. The company is reported operating about 50 per cent. of normal. It believes the coming fall and winter will be fair, with a decided improvement for the better in the spring.

National Bronze & Aluminum Castings Company: This company reports conditions rather quiet. The force is working five days a week and about 80 per cent. of capacity. The future, however, seems to be favorable. F. J. H.

CLEVELAND, OHIO

SEPTEMBER 1, 1921.

Turn of the month, bringing with it September and the first Fall month, also brings with it a decided turn for the better in industry generally throughout the Northern Ohio territory, and in the metal industry particularly. This is acknowledged to be the result of a persistent and consistent campaign on the part of big business in this section to go after and get new business. In consequence plants in many lines are resuming operations, in some instances on a close to normal scale.

Hardware firms are more active, and some report to be working 24 hours a day. Materials being turned out are not so much for the building industry as was anticipated early in the Summer, but for general purposes, although a more favorable outlet in the building trades is noted as Summer operations drew nearer to the completion stage. In the steel and iron division blast furnaces are starting, and with this basic industry under way, all branches of the metal trade is feeling the benefit.

One of the satisfactory developments is the resumption of automobile manufacture on a larger scale here, this being based upon orders booked through the Summer. As the automobile trade is one of the best bets in the field covered by the metal industry here particularly, this means, one more step toward the normal so long looked for. Parts and accessories interests report more liberal bookings for their particular products than for many months past.

The usual fly in the ointment must be reckoned with, here as elsewhere. There is no question but what there has been a good deal of unemployment in the Cleveland district, and this naturally has reduced the general buying power. So far retail interests fail to report response, but this is natural, considering the reduction in average incomes during the last six months.

Members of the **National Association of Ornamental and Bronze Manufacturers,** gathering at Cedar Point, were guests of plants in the vicinity of Sandusky. Reports of the activities of the organization and the business were submitted by President H. H. Suydan, Cincinnati; Secretary C. F. Metz, Cincinnati, and Fred J. Meyers, Hamilton.

Two new firms have been organized during the last month, both for the manufacture of automobile devices. Both devices are rear signals. One is the invention of **Paul A. Stover,** and he has formed the **Stover Signal Engineering Company,** with headquarters in the Perry-Payne Building. Several

orders already have been booked with the distributing trade, says Mr. Stover. **J. M. Elliott** has invented another signal, and has organized the **Three-in-one Signal Company,** with establishment at 7030 Wade Park avenue. Both devices are well covered by patents, the inventors assert.

The **Twin Dry Cell Battery Company** has taken property from the **Guide Motor Lamp Company** at Madison avenue and West 114th street. The two story manufacturing building on this part of the property will be occupied for production purposes. C. C. C.

LOUISVILLE, KY.

SEPTEMBER 1, 1921.

Business is just a bit better with the Louisville trade this month, but still far from normal. Prospects are just a little better, and the feeling is a little more optimistic than it was last month, when Indigo was a proper coloring. The automobile industry and a few others have been just a little more active, but general machine shops and metal working plants are operating on one bell and that a slow one, with the result that there is not much demand for brass or cooper castings or aluminum parts.

District Manager **Holway,** of the **U. S. Employment Bureau,** in a recent report on industrial operations in Kentucky and Southern states over which he holds jurisdiction, showed that all divisions of the metal working and machine trades are quiet. However, he reported that Louisville, due to diversified industries, was busier than most other industrial cities.

Strikes in the Cinncinnati district have not affected business in Louisville, as demand for brass and copper goods has been so small that there has been no business coming to Louisville as a result of the situation in the Queen City. Louisville is paying the union scale, but working open shop, and having no trouble.

It is reported that consumers of castings are not buying or stocking, and are merely buying in hand to mouth lots, hoping for a lower market.

Railroad demand is a little more active, as the railroads are now handling more freight, and increasing shop forces, the Illinois Central and Southern Railways having increased forces at Paducah, Ky., and Somerset, Ky., within the past month, and the L. & N., is increasing forces a little at Louisville.

Local wagon and implement as well as auto manufacturers report business as a little quiet, but somewhat better that it was earlier in the year. Improved cotton and agricultural conditions are making for a better outlook in the South as a whole.

Through the Kentucky Manufacturers' Association industrial concerns are making ready to fight any efforts of labor for an eight hour day, minimum wage laws, and other similar ideas, which are expected to crop up before the next session of the General Assembly in January. A. W. W.

MONTREAL, CANADA

SEPTEMBER 1, 1921.

Just at present there is but one universal question, "When will business come back?" The answers are optimistic or pessimistic in accordance with the character of the individual and the state of his personal affairs. The demand for metal goods in the non-ferrous lines is increasing, although slowly. The volume of sales for the past month has increased and is governed largely by buyers who desire quick shipment. But there is every indication that orders will increase progressively from now on. In the manufacturing jewelry lines the situation is very quiet. Few, if any, plants are operating full time and the average is on a 50 per cent. basis of normal productions. There are prospects to encourage the resumption of an increase in production this next month from heavy inquiries and placing of orders from the west.

S. R. Francis, superintendent, Ontario Specialities, Limited, brass manufacturers of Ottawa, Ont., was in Montreal this past week and reports business picking up with his concern. They make a specialty of paper mill machinery brass goods, and as the province of Quebec is one of the largest producers of paper and pulp it creates a demand for their product the entire year; more especially when new plants are in course of construction.

The Lynburner Brass Works, Inc., 1025 Boyer street, are still operating on a full time basis and they have been more fortunate than other brass manufacturers, as their line of goods is fire apparatus and fire engine equipment.—P. W. B.

BIRMINGHAM, ENGLAND

AUGUST 17, 1921.

Business in all trades continues bad. Sales are chiefly for the home trade and that is restricted by the prevalence of unemployment and shortness of money. Export business has scarcely yet begun to move. Buyers abroad have yet large stocks purchased at last year's high prices. Such orders as come in to merchants are often accompanied by a request for further credit. Still a hopeful spirit is maintained in the manufacturing world. Since the August holiday a number of firms in the brass trade have increased their hours of working, whilst here and there a factory is on full time. The metal rolling and tube mills which were closed during the coal strike have reopened. The official figures show a reduction of 70,000 in the number of registered unemployed during the past month. But the activity in the factories finds little justification in the state of the order books. Enquiries continue to increase in number without any immediate prospect of materialization into orders. In the brass trade, makers of steam, gas and water fittings are best employed, the demand from Australia being fairly well sustained. The electrical fittings trade is bad, business with the European Continent, which in former days took a large portion of the British product, being at a standstill. Stampers are very short of business. The stagnation of shipbuilding has had a very bad effect on the Birmingham brass trade. One firm making brass hinges has been closed for three weeks. Jewelers are still very little employed especially in the personal ornament departments. Some improvement in the electro-plating trades is reported, but chiefly in the spoon and fork and other "useful" departments. In all trades buyers are holding off for reductions, and in view of this possibility refrain from ordering more than necessary replacements. Full employment cannot be hoped for as long as the exchange and other international financial difficulties continue, and there is no sign yet of any decided change for the better. H.

VERIFIED NEWS

The **National Lead Company,** New York, has earned dividend requirements, according to a statement in the New York Wall Street Journal of August 19. About 95 per cent. of the profits come from the white lead branch of the business. Other branches are still feeling the depression.

The **General Abrasive Company,** Niagara Falls, N. Y., has announced a cut of 8 per cent. in the price of their abrasive grains.

The **Dodge Sales & Engineering Company,** of Mishawaka, Ind., announce that the excavation for their new $1,000,000 building in New York City at 49 Park Place is practically completed. The new building will occupy 165 feet on West Broadway, 50 feet on Murray street and 75 feet on Park Place. Present plans call for twelve stories, but foundation and construction will permit of an additional four stories if needed.

The **Baker-Payne-Voye Company,** 1177 Adams street, Boston, Mass., has been incorporated with a capital of $50,000, as a jobber of sheet metals and tinsmiths' supplies.

The **William H. Hess Electric Company,** 63 Phelps street, Oneida, N. Y., was recently incorporated and has taken over the business conducted by William H. Hess, who is the principal stockholder. It is capitalized at $15,000. It contemplates the erection of a plant upon the expiration of its present lease, which will be in about six months. In addition to manufacturing aluminum ware and metal specialties, it will engage in electrical contracting and will sell and install farm lighting plants, etc. The company operates an aluminum foundry, spinning, stamping and polishing departments.

Hugh J. Finnigan, Lippitt, R. I., has established a foundry for making brass, bronze and aluminum castings for all requirements, and has commenced operation.

The **Standard Metalwork Corporation,** Thompsonville, Conn., which was reported shut down, because of cancelled orders, refutes this statement, saying that the shipment of orders was merely requested to be held up for the present by their customers. The company is again running full time with a moderate force. It operates a brass machine shop, tool room, grinding room, spinning, brazing and plating departments.

George W. Kyle & Company, Inc., Grand and Thompson streets, New York, N. Y., desire to again inform the trade in general that they are the fully authorized exclusive distributors of the General Platers' Supply Company, Inc. This information is given for the purpose of eliminating in some cases the possibility of misunderstanding. All inquiries should be directed to George W. Kyle & Co., Inc.

The **National Metal Products Company, Inc.,** has made an addition to its plant to melt nickel. They now manufacture nickel anodes in all shapes and sizes, in two grades—90-92% and 97-99% pure. It is stated that their anodes are made only of pure shot nickel, no scrap or foreign metals being used.

The **Lumen Bearing Company,** of Buffalo, N. Y., and Youngstown, Ohio, manufacturers of the line of machine-bronze, brass and bronze castings and bearings, solders and babbitts, have located in Chicago a branch office that will supply and handle all business of the company west of and including Michigan, with the exception of the City of Detroit, and west of a line from Toledo, to Columbus to Cincinnati, Kentucky, Tennessee and Georgia. H. S. Huncke is the Western sales manager, with Henry Waters as associate salesman. The office is located at 15 No. Jefferson street, Chicago.

The **Jeweler's Technical Advice Company** has bought the three-story office building at 22 Albany street, New York, which it will occupy for its business, now located at 5 Cortland street, New York.

The **A. P. Swoyer Company,** merchandise stock at 17 North 7th street, Philadelphia, has been purchased and the premises formerly occupied by Swoyer leased to **U. T. Hungerford Brass & Copper Company,** 510 Arch street, Philadelphia. Possession will be taken by the Hungerford company on September 1, and they purpose carrying a full line of brass, copper, Tobin bronze, nickel silver and monel metal products, in Philadelphia, in sheets, rods, tubes, wire, nails, tacks, etc.

The **Ireland and Matthews Manufacturing Company,** one of the oldest firms in Detroit, has announced that it will increase its capital stock by $700,000.

This firm, established since 1889, supplies automobile parts, mostly metal stampings, ranging from hub caps to instrument board plates. The firm, in addition, manufactures stove trimmings (for sixty per cent. of the stove manufacturers, it is estimated), plumbers' supplies, bolts, nuts and rivets. **William S. Knudsen,** for 10 years associated with the Ford Motor Company, resigned from the Ford organization to become associated with the Ireland & Matthews as general manager. Previous to joining the Ford organization he had years of experience in various capacities in the metal stamping industry.

COPPER TRADE TO SPUR UP SALES

R. L. Agassiz, president of the Calumet and Hecla Mining Company, announced, August 9, the formation of the Copper and Brass Research Association, an incorporated organization of the copper, brass and copper alloy interests. The purpose of the organization is to stimulate the use of those metals. Membership in the association is open to producers of copper sold here or selling agents of copper in the United States; to fabricators of copper, brass and copper products generally in the United States and Dominion of Canada, and to others directly engaged in or connected with the copper and brass industries.

The officers of the association are: R. L. Agassiz, president; Fred S. Chase and C. F. Kelley, vice-presidents; Stephen Birch, treasurer; W. S. Eckert, secretary. William A. Willis has been appointed manager of the association, which has offices at 25 Broadway.

Membership in the association now includes the following: American Smelting and Refining Company, Anaconda Copper Mining Company, Braden Copper Company, Calumet and Hecla Mining Company, Calumet-Arizona Mining Company, Chile Exploration Company, Chino Copper Company, Chase Metal Works, Chase Rolling Mills Company, Copper Range Company, East Butte Copper Mining Company, U. T. Hungerford Brass and Copper Company, C. G. Hussey & Co., Kennecott Copper Corporation, Lake Copper Company, Michigan Copper and Brass Company, Miami Copper Company, Mother Lode Coalition Mines Company, the National Brass and Copper Company, Nevada Consolidated Copper Company, North Butte Mining Company, New Cornelia Copper Company, Phelps Dodge Corporation, Quincy Mining Company, Ray Consolidated Copper Company, Rome Brass and Copper Company, Scovill Manufacturing Company, Shattuck-Arizona Copper Company, Taunton-New Bedford Copper Company, and Utah Copper Company.—New York Times, Aug. 10, 1921.

CENSUS BUREAU'S SUMMARY OF METAL WIRE INDUSTRY

	1919 QUANTITY TONS	1919 VALUE	1914 QUANTITY TONS	1914 VALUE
Copper	.....	$114,234,200	.....	$42,928,600
Bare wire.....Tons	193,370	.....	.....	.....
For sale ..... "	161,660	68,011,300	84,920	26,206,000
Consumed in works ..... "	31,710	.....	.....	.....
Rubber insulated cable .....[1] "	24,570	18,738,100	48,390	15,709,300
Paper insulated cable .....[1] "	20,200	11,451,400		
Insulated wire.[1] "	29,470	15,216,700		
Other fabricated copper wire products.	990	816,700	2,130	1,013,300
Brass wire ....Lbs.	50,521,000	16,024,500	39,614,500	6,366,300
Other metals...[2] "	14,596,000	6,339,700	6,929,400	1,489,500
Finished products other than wire products	.....	3,058,000	.....	2,581,000
All other produsts, copperas, scrap, dross, custom work, etc.	.....	4,623,900	.....	3,019,600

[1] Not including insulated wire and cable made in establishments purchasing the wire, value $84,216,900. Total production, 1919, rubber insulated cable, 39,386,900; paper insulated cable, $25,664,300; insulated wire, $64,571,900; aggregate, $129,623,100.

[2] Copper-clad steel, monel metal, nickel alloys, zinc, etc.

In 1914 there were 20 brass and copper rolling mills, wire departments and other concerns making wire. The value of the product was $54,909,900. In 1919 there were 21 concerns and the product was valued at $90,759,500.

NEW CLASSIFICATION OF SCRAP

A new classification of scrap has been prepared by the American Railway Association, Division 4, in charge of purchases and supplies. Metal classifications are as follows:

61 Aluminum.

62 White metal No. 1—Including various mixtures of clean bearing or lining metals, such as babbitt, metallic packing, etc.

63 White Metal No. 2—All non-bearing white metals, exclusive of aluminum.

66 No. 1 brass—Locomotive bearing metal, such as driving, crown and rod brass, free from white metals, excluding car and tender bearings.

67 No. 2 brass—Steam metal brass, including valves and fittings, injector and lubricating bodies and parts and check valves.

68 No. 3 brass—Journal bearings free from babbitt.

69 No. 4 brass—Brass or bronze borings, drillings and turnings.

70 No. 5 brass—Yellow brass castings, to include coach trimmings, light brass, hose couplings, pipe, tubes, etc.

71 Copper cable, insulated—Specify kind.

72 Copper, No. 1—Wire free from insulation, flue ferrules, pipe and tubes.
73 Copper, No. 2—Sheet copper, sheathing and roofing, free from paint and nails.
74 Copper, No. 3—Sheathing and roofing copper, with paint and nails.
75 Copper, No. 4—Battery copper.
76 Copper, No. 5—Dross and oxide (report separately).
79 Lead—Sheet, pipe, etc.
80 Lead—Battery.
81 Lead—Battery mud or sediment (specify wet or dry).
91 Zinc—Battery or sheet (specify kind).

MUELLER COMPANY REPRESENTATIVES

The Mueller Metals Company, Port Huron, Mich., is appointing sales representatives in all the larger cities of the country. Those thus far appointed are: Hunter & Wilkie, 603 Kerr building, Detroit, to handle the Mueller products, exclusive of rod and tubing, in Detroit and vicinity, and the Steel Sales Corporation, with offices at 129 South Jefferson street, Chicago, and 404 Book building, Detroit, to handle rod and tube in Detroit and the complete Mueller line in Illinois and northern Indiana and Michigan territory outside of Detroit, and in the states of Iowa, Missouri and Wisconsin; Hughes-Limbach Company, Hippodrome building, Cleveland, Ohio; H. L. Hess Company, Baily building, Philadelphia, Pa.; Clayton A. Nenno, Marine Trust building, Buffalo, N. Y.; B. E. Griffey Motor Supply Company, Indianapolis, Ind. (everything but rod and tubing); Alexander-Marlowe Company, Fidelity Trust building, Indianapolis, Ind. (handles rod and tubing in the same territory in which Griffey handles the other products); E. G. Farnsworth, Dayton Savings & Trust building, Dayton, Ohio.

The Mueller Company operates a brass, bronze and aluminum foundry, a brass machine shop, tool room, brass and bronze rod extruding mill, brass and copper seamless tube mill, casting shop, tinning and polishing shops. The company also makes forgings in brass, bronze and aluminum, and die castings in white metal and aluminum alloys.

TRADE PUBLICATIONS

Polishing Meal and Cut Leathers.—A folder on these polishing machines for dry barrel tumbling, issued by The Peckham Manufacturing Company, Newark, N. J.

The Gas-Filled Incandescent Lamps.—Research Narrative No. 15, issued by the Engineering Foundation, New York.

Despatch Electric Ovens.—An attractive catalog describing and illustrating electric ovens for heating, baking and electrical testing, issued by the Despatch Manufacturing Company, Minneapolis, Minn.

Wrought Tungsten.—Research Narrative No. 14, issued by the Engineering Foundation, New York.

Modern Polishing.—Some practical notes on the selection and use of polishing materials. A very interesting and instructive booklet issued by the General Abrasive Company, Niagara Falls, N. Y.

Evening Classes.—Bulletin issued by the Pratt Institute, Brooklyn, on the evening classes of its School of Science and Technology.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	$100	$450	$500
American Brass	100	162	168
American Hardware Corp.	100	126½	...
Bristol Brass	25	10	...
International Nickel, com.	25	12½	12¾
International Nickel, pfd.	100	75	84
International Silver, com.	100	30	40
International Silver, pfd.	100	86	92
New Jersey Zinc	100	114	117
Rome Brass & Copper	100	115	125
Scoville Mfg. Co.	100	285	300
Yale & Towne Mfg. Co.	...	230	240

Corrected by J. K. Rice, Jr., & Co., 36 Wall Street, New York.

METAL MARKET REVIEW

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE

COPPER

SEPTEMBER 1, 1921.

The copper situation in August, while not realizing the full improvement hoped for in the industry, did show signs of betterment in the closing days of the month, with more frequent inquiries and some recovery in prices from the earlier declines. No doubt exists that larger sales could have been made except for the refusal to accept bids under 12c. per pound. At the beginning of the month, in the outside market, prompt and August lake copper, delivered, was quoted at 12.25c. per pound; electrolytic, f. o. b. refinery, 11.75-12.00c., and casting copper, 11.50c., while producers' prices for prompt and August, delivered, was 12c.; September, delivered, 12.25c. False rumors, about August 8, that electrolytic was offered at 11.50c., brought out large inquiries. For a few days toward close of first fortnight improved sentiment in the outside market made asking prices about ¼c. per pound higher, producers' levels remaining unchanged. Weakness in the London market was a depressing factor, and with a decline there on August 22, quotations here for delivered copper again declined ¼c. per pound. In the closing three days, a fair volume of business was reported, with a recovery of about ⅛c. per pound in prices. On the last day of August outside market was: Lake, 12.00-12.25c.; electrolytic, 11.75-11.87½c.; casting, 11.50c. Producers' prices, September, delivered, 12.00c.; October, delivered, 12.12½c.

TIN

Lower prices for tin did not stimulate demand from consumers in this country. The tin situation indicates that a larger consumption of the metal is necessary if further addition to the already existing enormous stocks is to be prevented. Production for a year or longer has been in excess of consumption. Prices during the month fluctuated from 26.75c. for Straits, 26.62½c. for American pure, and 25.75c. for 99% tin at the beginning of the month to the highest levels on August 8, with Straits and American pure 27.75c. and 99% metal 26.75c., and then ranged to the lowest levels. Straits and American pure, 25.50c., with 99% tin 25.12½c. per pound. A recovery later in the month carried to 27.00c., Straits; 26.75c., American pure; 26.50c. for 99%; making the net result an advance of ¼c. per pound on Straits. Demand, however, continued laggard, notwithstanding a better inquiry from the retail trade—an indication that stocks in such hands are diminished.

LEAD

Demand for lead, which during the entire year has been better than demand for other metals, continued during August, becoming of a more general character, however, covering requirements in nearly all lines of lead consumption as compared with past demand, which was confined largely to purchases by pigment interests and for storage battery requirements. Prices were steady throughout the month, there being no change made in the basis of the American Smelting & Refining Company—4.40c. per pound, East St. Louis and New York, for prompt shipment from the West. In the outside market, fluctuations were within narrow limits, the opening quotations—4.20c. East St. Louis, 4.40-4.45c. New York—showing no change from the July closing.

ZINC

The August zinc market continued flat, with a further reduction in prices which were already lower than any in the past ten years' record. The few producers running early in the month

were doing so at a sacrifice. General expectations for improvement, which had seemed justified because of the inquiries coming from galvanizers, and while for not large tonnages was well distributed. Prices were kept steady at the opening levels—4.20c. East St. Louis, 4.70c. New York, for prompt primary—more through cheerful sentiment than actual improvement in buying interest until August 9, when brass manufacturers and galvanizers became purchasers and prices were at once advanced five points to 4.25c. East St. Louis, 4.75c. New York, with five points premium asked for each succeeding month's shipments. Activity at once was checked, proving conclusively that the low level of prices had been the attraction and not consuming requirements. Some business with the Orient was put through about this time. Closing levels were 4.15-4.20c. East St. Louis, 4.65-4.70c. New York, showing a recovery to within 2½ points of the opening price.

ALUMINUM

Practically stagnant conditions in the aluminum market brought about a further reduction in outside market prices during August. The producer, however, made no announcement of any change from the schedule issued July 18, which carried its prices to 25.00c. for 99% and purer; 24.50c. for 98-99% virgin; 24.10c. for No. 12 alloy, and 39.10c. for sheet 18ga., all in 15-ton lots, f. o. b. producer's plant. Outside market opening levels were unchanged from the July closing—22-23c. for virgin 98-99% metal, 19-20c. for 98-99% remelted, and 17-18c. for No. 12 remelted. The total and net decline was 3c. per pound on virgin ingots, 98-99%; 2c. per pound each on 98-99% remelted and on No. 12 remelted.

ANTIMONY

Antimony in August continued its downward trend in prices, with no change in conditions previously noted. The market seems dead, but arrivals from the Orient continue in more or less quantity. Stocks on dock were offered below spot quotations, causing further recessions in price level. By August 19, a ten-point decline in prices had occurred, to 4.50c. duty paid carloads. This figure was still quoted at the end of the month, making the net decline 10 points.

SILVER

United States total purchases of domestic silver, reported August 30, under the Pittman Act, amounted to 70,204,430 ounces. Silver importations, according to Government returns covering first half of 1921, were $31,963,642. Exports during same period were $26,154,437. Price fluctuations of foreign bars ranged from the opening 61½c. per ounce to the lowest level, 60c. on August 9, and then advanced to 62½c. per ounce by August 25, after which there was a recession to 62¼c. Domestic silver bars is pegged at 99¼c. per ounce.

QUICKSILVER

Quicksilver prices, after opening $46-47 per flask of 75 pounds, the July closing, owing to practically stagnant conditions, declined August 24 to $45-46 per flask, with no further change at the close. Consumption of quicksilver has been seriously contracted.

PLATINUM

Platinum prices in August gradually advanced from $65 per ounce for pure, at the beginning of the month, to $78 per ounce August 24, indicating increased demand from consuming interests.

OLD METALS

Sentiment in the old metals market, at the end of August, showed a little improvement over the discouraged feeling that previously had been in evidence. Prices, however, showed small net change. Light copper at the close was off ½c. to 7c. per pound; strictly crucibled, unchanged 9.50c., while uncrucibled was up ¼c. to 8.75c. per pound. The brasses were all up ¼c. per pound; light brass to 3.75c., heavy brass to 4.50c., and No. 1 brass turnings to 4c., with new clippings and special heavy unchanged, the former 4.50c., the latter 6.25c. Composition scrap and No. 1 composition turnings were quiescent at unchanged levels, 7c. and 6c. each, respectively. Aluminums were stagnant, with borings and clippings unchanged, while old sheet and old cast were off ¼c. to 8.75c. each. No. 1 pewter was up 1c. to 15c. per pound. Other items were practically unchanged, and the volume of business, as a whole, was very unsatisfactory in August.

AUGUST MOVEMENT IN METALS

Copper:	Highest	Lowest	Average
Lake	12.25	12.00	12.114
Electrolytic	12.00	11.50	11.761
Casting	11.50	11.25	11.435
Tin	27.75	25.50	26.402
Lead	4.25	4.20	4.228
Zinc (brass special)	4.35	4.20	4.286
Antimony	4.60	4.50	4.548
Aluminum	23.00	19.00	20.217
Quicksilver (per flask)	$47.00	$45.00	$46.239
Silver (cts. per oz.), foreign.	62½	60	61.597

WATERBURY AVERAGE

Lake Copper.—Average for 1920, 18.06—January, 1921, 13.75—February, 13.50—March, 12.625—April, 12.75—May, 13.125—June, 13.125.—July, 12.875.—August, 12.25.

Brass Mill Zinc—Average for 1920, 8.33—January, 1921, 6.05—February, 5.50—March, 5.25—April, 5.20—May, 5.30—June, 5.00—July, 4.80.—August, 4.70.

Metal Prices, September 6, 1921

NEW METALS

Open Market

	Cents
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Electrolytic, carload lots, delivered	12c.
Lake, carload lots, delivered	12¼c.
Casting, carload lots, delivered	11¾c.
TIN—Duty free.	
Straits, carload lots	27c.
LEAD—Duty, Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots	4.40
ZINC—Duty 15%.	
Brass Special	4.77½
Prime, Western, carload lots	4.67½
ALUMINUM—Duty, Crude, 2c. per lb. Bales, sheets, bars and rods, 3½c. per lb.	
Small lots, f. o. b. factory	....
100-lb f. o. b. factory	....
Ton lots, f. o. b. factory	19-25
ANTIMONY—Duty 10%.	
Cookson's Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot	4.50
NICKEL—Duty, Ingot, 10% ad valorem. Sheet, strip, strip and wire, 20%.	
Ingot	41.00
Shot	41.00
Electrolytic	44.00
MANGANESE METAL—95-98% Mn., carbon free, per lb. Mn. contained	0.75
MAGNESIUM METAL—Duty 20% ad valorem (100 lb. lots)	$1.25-1.35
BISMUTH—Duty free	1.50-1.55
CADMIUM—Duty free	1.00-1.10
CHROMIUM METAL—95-98% Cr., per lb. Cr. contained	1.50
COBALT—97% pure	Nominal 3.00-3.25
QUICKSILVER—Duty 10% per flask of 75 lbs	45.00-46.00
PLATINUM—Duty free, per ounce	78.00
SILVER—Government assay—Duty free, per ounce	.99¼
GOLD—Duty free, per ounce	20.67

Metal Prices, September 6, 1921

INGOT METALS

Silicon Copper, 10%	according	to	quantity	34 to38
Phosphor Copper, guaranteed 15%	"	"	"	16⅛to28⅜
Phosphor Copper, guaranteed 10%	"	"	"	15⅞to27⅞
Manganese Copper, 30%	"	"	"	50 to56
Phosphor Tin, guarantee 5%	"	"	"	35⅝to45⅝
Phosphor Tin, no guarantee	"	"	"	35 to45
Brass Ingot, Yellow	"	"	"	9 to12
Brass Ingots, Red	"	"	"	12.15to14.15
Bronze Ingot	"	"	"	13½to16½
Parsons Manganese Bronze Ingots	"	"	"	16½to18
Manganese Bronze Castings	"	"	"	27 to36
Manganese Bronze Ingots	"	"	"	13 to16
Manganese Bronze Forgings	"	"	"	30 to40
Phosphor Bronze	"	"	"	24 to30
Casting Aluminum Alloys	"	"	"	19 to21
Monel Metal	"	"	"	38

OLD METALS

Buying Prices		Selling Prices
9 to 9½	Heavy Cut Copper	10½to11
8½to 9	Copper Wire	10 to11
7½to 8	Light Copper	9 to 9½
8½to 9	Heavy Machine Comp.	10½to11
5½to 6	Heavy Brass	7 to 7½
3½to 4	Light Brass	5 to 5½
4¼to 4½	No. 1 Yellow Brass Turnings	5¼to 5½
6½to 7	No. 1 Comp. Turnings	8 to 8½
3½	Heavy Lead	4
3½	Zinc Scrap	4
4½to 5	Scrap Aluminum, Turnings	6½to 7½
10 to11	Scrap Aluminum, cast alloyed	12 to13
13 to14	Scrap Aluminum, sheet (new)	15 to16
18	No. 1 Pewter	22
14½	Old Nickel anodes	16½
22½to24½	Old Nickel	26½to28½

Prices nominal—No market.

BRASS MATERIAL—MILL SHIPMENTS

In effect Sept. 1, 1921

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.15¼	$0.16¾	$0.18
Wire	.15¾	.17¼	.18½
Rod	.13¼	.17¾	.19
Brazed tubing	.25	....	.29¾
Open seam tubing	.25	....	.29¾
Angles and channels	.30	....	.34¾

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.16¼	$0.17¾	$0.19
Wire	.16¾	.18¼	.19½
Rod	.14¼	.18¾	.20
Brazed tubing	.26	....	.30¾
Open seam tubing	.26	....	.30¾
Angles and channels	.31	....	.35¾

SEAMLESS TUBING

Brass, 18c. to 19c. per lb. base.

Copper, 19½c. to 20½c. per lb. base.

TOBIN BRONZE AND MUNTZ METAL

Tobin, Bronze Rod	17¾c. net base
Muntz or Yellow Metal Sheathing (14"x48")	15¼c. " "
Muntz or Yellow Rectangular Sheets other than Sheathing	16¼c. " "
Muntz or Yellow Metal Rod	13¼c. " "

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	19½c.-20½c. net base
From stock	20½c.-24¾c. net base

BARE COPPER WIRE—CARLOAD LOTS

13¾c. to 14¾c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order	17¾c. per lb. base
100 lbs. to 300 lbs. in one order	18¾c. per lb. base

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 10c. basis less 8 per cent. discount.

Casks, jobbers' prices	11c.-12½c.
Open casks, jobbers' prices	11c.-13c.

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga. and heavier, base price	39c.
Aluminum coils, 24 ga. and heavier, base price	33½c.

NICKEL SILVER (NICKELENE)

Base Prices

Grade "A" Nickel Silver Sheet Metal

10%	Quality	27¼c. per lb.
15%	"	29¾c. " "
18%	"	30½c. " "

Nickel Silver Wire and Rod

10%	Quality	29c. per lb.
15%	"	33¼c. " "
18%	"	36c. " "

MONEL METAL

Shot	35
Blocks	35
Sheet Bars	40
Hot Rolled Rods (base)	42
Cold Drawn Rods (base)	56
Hot Rolled Sheets (base)	55

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25s. over. Above prices f. o. b. mill.

Lead Foil—base price—figured on base price of lead at the time.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 65c. to 67c. per Troy ounce, depending upon quantity.

Rolled sterling silver, 64c. to 67c.

NICKEL ANODES

85 to 87%	purity	.50c. per lb.
90 to 92%	"	.52½c. per lb.
95 to 97%	"	.55c. per lb.

Supply Prices, September 6, 1921

CHEMICALS

In Commercial Quantities

Acid—		
Boric (Boracic) Crystals	lb.	.15
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.02½
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg. Carboys	lb.	.07
Nitric, 42 deg. Carboys	lb.	.07¼
Sulphuric, 66 deg., Carboys	lb.	.02½
Alcohol—		
Denatured	gal.	.36
Alum—		
Lump, Barrels	lb.	.04
Powdered, Barrels	lb.	.05
Aluminum sulphate, commercial tech	lb.	.02½-.03
Aluminum chloride solution	lb.	.20
Ammonium—		
Sulphate, tech., Barrels	lb.	.04
Sulphocyanide	lb.	.75
Argols, white, see Cream of Tartar	lb.	.30
Arsenic, white, Kegs	lb.	.07
Asphaltum	lb.	.35
Benzol, pure	gal.	.40
Blue Vitrol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.05½
Calcium Carbonate (Prescipitated Chalk)	lb.	.05
Carbon Bisulphide, Drums	lb.	.07½
Chrome Green	lb.	.40-.45
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.48
Carbonate, Barrels	lb.	.20
Cyanide	lb.	.63
Sulphate, Barrels	lb.	.06
Copperas (Iron Sulphate, bbl.)	lb.	.02½
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.28
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton.	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	3.25
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	.30
Shellac	lb.	—
Iron, Sulphate, see Copperas, bbl	lb.	.02½
Lead Acetate (Sugar of Lead)	lb.	.12-.13
Yellow Oxide (Litharge)	lb.	.09
Mercury Bichloride (Corrosive Sublimate)	lb.	.68
Nickel—		
Carbonate Dry	lb.	.50-.55
Chloride, 100 lb. lots	lb.	.30-.40
Salts, single, bbls.	lb.	.12-.13
Salts, double, bbl	lb.	.14-.15
Paraffin	lb.	.07-.10
Phosphorus—Duty free, according to quantity		.30-.35
Potash, Caustic, Electrolytic 88-92% fused, drums	lb.	.06
Electrolytic, 70-75% fused	lb.	.10
Potassium Bichromate, cacks	lb.	.13
Carbonate, 80-85%, casks	lb.	.07
Cyanide, 165 lb. cases, 94-96%	lb.	.42½
Pumice, ground, bbls	lb.	.05
Quartz, powdered	ton.	$30.00
Official	oz.	—
Rosin, bbls.	lb.	.03½
Rouge, nickel, 100 lb. lots	lb.	.40
Silver and Gold	lb.	.60
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.07
Silver Chloride, dry	oz.	.86
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.42
Soda Ash, 58%, bbls	lb.	.03
Sodium—		
Biborate, see Borax (Powdered), bbls	lb.	.05¾
Bisulphate, tech., bbls	lb.	.03½
Cyanide, 96 to 98%, 100 lbs	lb.	.28-.30
Hydrate (Caustic Soda) bbls	lb.	.04½
Hyposulphite, kegs	lb.	.04
Nitrate, tech. bbls	lb.	.04½
Phosphate, tech., bbls	lb.	.06
Silicate (Water Glass) bbls	lb.	.03
Sulpho Cyanide	lb.	.60
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.12-.13
Sulphur (Brimstone) bbls	lb.	.03
Tin Chloride	lb.	.40
Tripoli	lb.	.03½
Verdigris, see Copper Acetate	lb.	.48
Water Glass, see Sodium Silicate, bbls	lb.	.03
Wax—		
Bees, white ref. bleached	lb.	.55
Yellow, No. 1	lb.	.21
Whiting, Bolted	lb.	.03-.06
Zinc, Carbonate, bbls.	lb.	.07
Chloride, 600 lb. lots	lb.	.10-.12
Cyanide	lb.	.46
Sulphate, bbls.	lb.	.03½

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base,	$25.35
14 " 20 " 64/68, "	"	31.50
12 " 20 " 84/92, "	"	38.90
14 " 20 " 84/92, "	"	53.00

Sewed buffs, per pound

Bleached and unbleached	"	.45

FELT WHEELS

		Price Per Lb. Less Than 100 Lbs.
Diameter—6" to 18"	1"	$3.20
" 6" to 18"	1" to 3"	2.30
" 6" to 18"	over 3"	2.50
GREY MEXICAN OR FRENCH GREY—		
Diameter—6" to 18"	1"	3.10
" 6" to 18"	1" to 3"	2.20
" 6" to 18"	over 3"	2.40

Above are even diameters. Odd diameters 25c. advance.